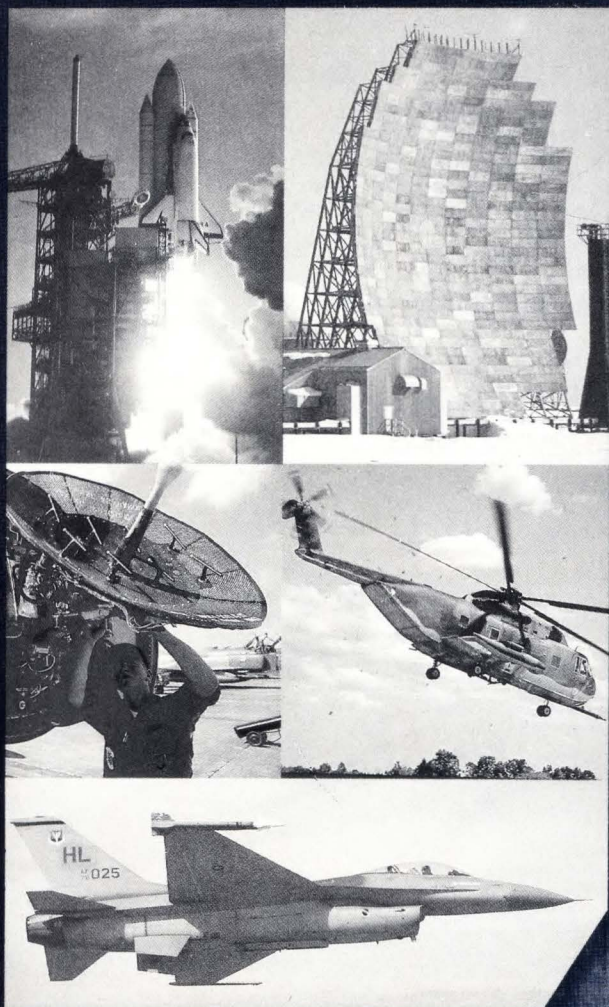


RF/IF signal processing components guide



finding new ways . . .
setting higher standards

 **Mini-Circuits**



at Mini-Circuits
we're dedicated to pursue
product innovations and
improvements to satisfy
our customers' current
and future needs.

finding new ways...

such as a proprietary HTRB
diode-screening technique,
computer-automated performance
data (CAPD) documentation
and off-the-shelf TX mixers.

setting higher standards

with the industry's only 3-year
guaranteed mixers,
-55 dB guaranteed third-order IM mixers,
highest output (1000 mv) phase detectors,
widest bandwidth directional couplers
...just to name a few.

Our commitment to
the customer never ends.

finding new ways ...
setting higher standards

 **Mini-Circuits**

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ordering information

Federal supply code: 15542

how to order

Your local representative or distributor is the contact for both sales and service assistance for products listed in this catalog. These local offices have the latest price and delivery information on all models. They can also provide details on ordering procedures, service information and application engineering data. Your order may be sent directly to Mini-Circuits or to any of the local sales offices listed.

Prices listed in this catalog are domestic F.O.B. Brooklyn, New York. Mini-Circuits reserves the right to change specifications, models, prices or designs without prior notice and without liability for such changes.

shipping instructions

Shipments can be made by either air or surface carriers. If specific shipping instructions do not accompany the order, Mini-Circuits will specify the carrier to be used.

terms

Net 30 days from date of invoice. If credit is not established with Mini-Circuits, shipments will be made C.O.D. (cash on delivery) or prepaid. When sending prepayments, please include freight.

warranty

Scientific Components Corporation, Mini-Circuits division, warrants each product manufactured by Mini-Circuits to meet all published specifications and to be free from defects in material and workmanship. The Company's liability under this warranty is limited to repair, adjustment and/or replacement of defective parts returned, freight paid by Buyer, to the factory within a period of one year from date of shipment from the factory unless a shorter period is specified. International customers may ship to the Company's nearest Distributor.

Damage by misuse or abnormal conditions of operation, or evidence of partial or complete disassembly voids this warranty.

SINCE MINI-CIRCUITS HAS NO CONTROL OVER CONDITIONS OF USE, NO WARRANTY IS MADE OR IMPLIED AS TO SUITABILITY FOR CUSTOMER'S INTENDED USE, BEYOND SUCH PERFORMANCE SPECIFICATIONS AS ARE MADE A PART OF THE PURCHASE ORDER. Equipment shipped F.O.B. Mini-Circuits' plant shall become the property of the Buyer upon delivery to carrier. Damage in shipment should be handled by the Buyer directly with the carrier by immediately requesting carrier's inspection upon evidence of damage in shipment.

A fee will be charged to the Buyer to cover the costs of inspection and test of units returned under this warranty and subsequently found to meet specifications or to be faulty for reasons which are not Mini-Circuits' responsibility. This warranty excludes all other warranties expressed or implied. Mini-Circuits shall not be liable for any special, indirect or consequential damages.

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T3-1T	90
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*For performance data not given please consult factory.

how to use this guide

Over 1,000 RF/microwave signal-processing components are available to the design engineer from Mini-Circuits. This guide has been organized to simplify the process of selecting the component best suited to your application and need, to speed location of specs for a particular model, and to provide helpful application assistance.

A complete listing of all the product family groups—from frequency mixers to power splitters to RF transformers—plus warranty and ordering details are found on page 3.

Looking for data on a specific model? Page 4 contains a list of all models in alphabetical/numerical order, available from Mini-Circuits with reference to specific data pages.

For a concise production/test flow diagram illustrating Mini-Circuits quality-control procedures, turn to pages 6 and 7. Also detailed information on our Hi-Rel, HTRB and TX products for your military, space or rugged industrial applications.

Computer-automated- performance data (CAPD)

is a Mini-Circuits' innovation offering the most complete database for RF signal-processing components. What's involved in CAPD and its benefits towards your new designs are described on pages 8-13.



"Mastering the Mixer Maze" . . .

Mixer selection, with hundreds of models to choose from, can be confusing. The penalty for improper selection? Overspecify and pay extra; underspecify and face marginal performance. Read pages 20-21 for a clearly-detailed procedure for choosing the optimum mixer for your needs.

Data pages. Each data page is organized by series within the product line and by models within the series.

Information given includes CAPD data, National Stock Numbers (NSN), equivalent MIL—part numbers, pin connection designations; case styles, and notes to the tables.

Full technical data for each model is given in table form. The tables are arranged by sequence of model number for each series. The various models within a series differentiate from each other by the frequency range they cover. Frequency range is defined in the tables by the lowest frequency f_L to the highest frequency f_u . For most models, the frequency range is further subdivided into three segments; L = low range, M = mid range, and U = upper range. Each range L, M, U is defined at the bottom of each table in terms of f_L and f_u .

Mixer selection is primarily determined by selecting a mixer level suitable for the application. Therefore, to aid the designers, frequency mixers are organized in sequence of mixer level—Level 7, 10, 13, 17, 17S, 23, 23S and 27. At Level 7 mixer operates with +7 dBm LO drive, a level 13 mixer operates with +13 dBm LO drive, etc. For each level mixer, a maximum RF input level for linear operation is specified.

Power splitters are organized in numerical sequence of split; from 2 way 0°, 2 way 90°, 2 way 180°, 3-, 4-, 5-, 6-, 8-, 12-, 24-, to 48 way 0°.

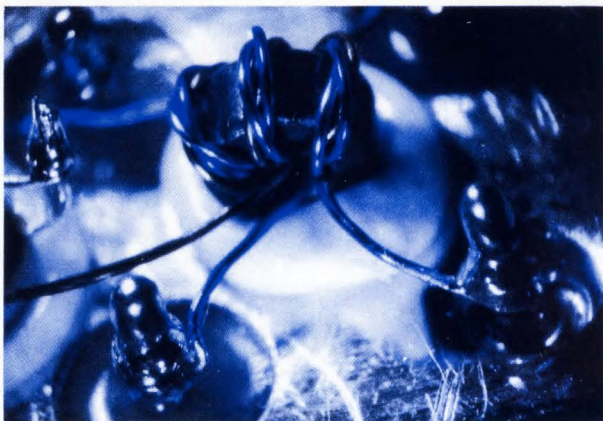
Case style and dimensions are easy to find . . . each data page includes a photo of the particular case style for each series and, within the data, there is reference to case style number and outline drawing letter. Turn to pages 14 to 18 for case style dimensions, tolerances and bracket options where applicable.

For example, the SRA-1 mixer detailed on page 22 calls for case A01. The dimensions and outline drawing are given in the table on page 14 and figure A on page 15.

Need Mini-Circuits components in a hurry? Refer to the rep listing in this directory for Mini-Circuits' worldwide network of sales representatives and distributors ready to serve your needs, supply your orders, and answer your questions promptly and courteously.

All Mini-Circuits' RF signal-processing components are subjected to rigid quality control procedures starting from raw material procurement through product production and final inspection; the objective—to supply our customers with the finest RF signal-processing components available. Here's a list of some of the procedures taken to insure high-quality performance and product reliability:

- A. 100% testing of each diode.
- B. 100% testing of each unit.
- C. 100% inspection of every solder connection.
- D. All transformers bonded to the header for protection against severe shock and vibration.
- E. All diodes, resistors and capacitors bonded to the header for protection against severe shock and vibration conditions.
- F. Diode and resistor power dissipation derated greater than 50%.
- G. All components rated for greater than + 125°C.
- H. All transformer leads double wrapped.
- I. Heavy coated wire insulation for HiPot/altitude.
- J. Completely encapsulated for protection against mechanical shock and vibration as well as temperature shock.
- K. Permanent case marking of model number cannot be removed by cleaning agents.
- L. Cupro-Nickel case for long-lasting finish especially under salt atmosphere conditions.



Every unit shipped from Mini-Circuits carries a full-year guarantee; in fact, our industry-standard SRA-1 mixer offers an exclusive three-year guarantee.

hi-rel components

High-temperature, Reverse-bias (HTRB) testing is an accelerated-life screening test generally reserved for space applications. Here the Schottky and PIN diodes are subjected to a one-volt negative bias at 150°C for 168 hours. The objective of this accelerated aging stress is to force time/temperature-related failures and thus screen out potentially unreliable devices; in conventional "baking" processes, the diode does not experience anywhere near the stress imposed by the HTRB program. The result: highly-reliable Schottky and PIN diodes ready for wiring into assemblies.

Next, the assembled units are subjected to additional testing procedures including

- (1) burn-in for 96 hours at 100°C with 8 ma at 1 KHz
- (2) thermal shock per MIL-STD 202, Method 107
- (3) Gross and fine leak tests according to MIL-STD 202, Test Method 112B, Conditions A and C

As a consequence of the above HTRB, final seal, and burn-in testing, Mini-Circuits components offer an unprecedented high level of reliability. In fact, Mini-Circuits' industry-standard SRA-1 is the only double-balanced mixer in the world to be offered with an exclusive *three-year* guarantee.

TX mixers

For the most critical space, military or industrial applications in hostile environments, Mini-Circuits offers TX mixers. Stringent screening and stressing are applied to the TX mixers which employ TX hermetically-sealed diodes that have passed the following tests per MIL-STD-750:

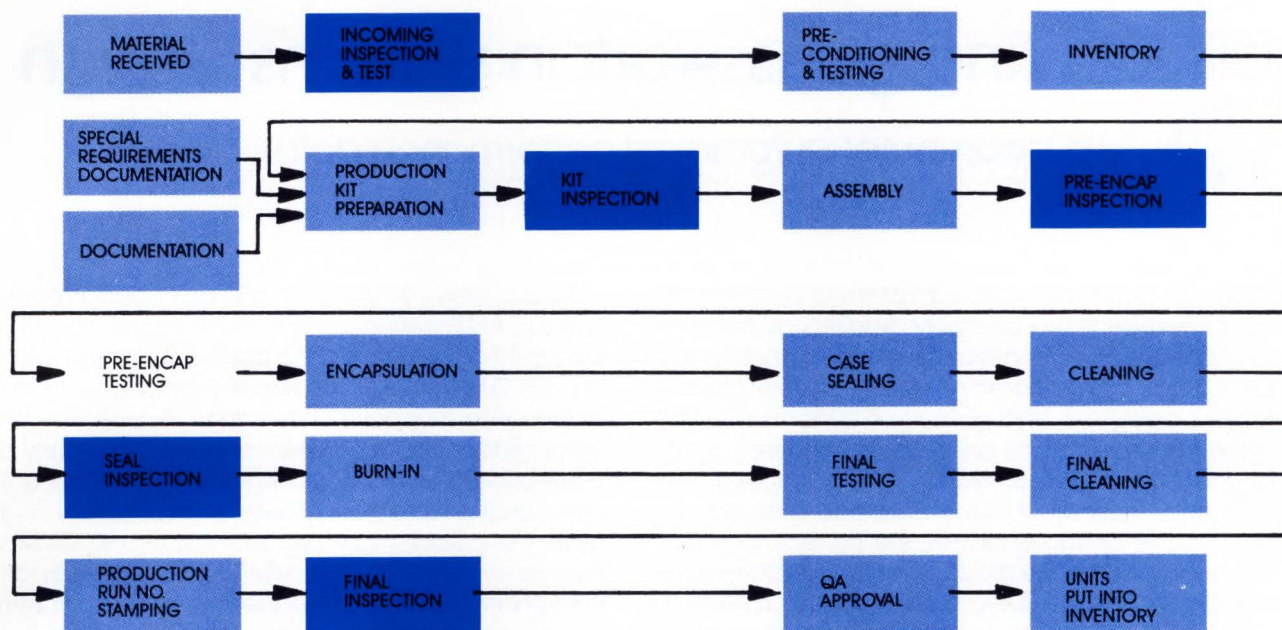
- (1) high-temperature storage for 340 hours at 150°C, Method 1032; (2) thermal shock, Method 1051, Test Condition C (– 65°C to + 150°C, 10 cycles); (3) constant acceleration, Method 2006, Y1 orientation, 20,000 G's; (4) fine leak, Method 1071, Condition H; (5) gross leak, Method 1071, Condition C; (6) burn-in for 96 hours at 25°C, 75mW/junction at 60 Hz, Method 1038, Condition B.

Those diodes that pass these rigid tests are then electrically tested to ensure that they meet specifications. They are then assembled into TX mixers which are then further exposed to these stress tests: (1) thermal shock, MIL-STD 202, Method 107; (2) burn-in for 96 hours at 100°C, with 8 ma at 1 KHz; (3) gross and fine leak, MIL-STD 202, Method 112B, Conditions A and C

The SRA-1TX is the first off-the-shelf TX mixer in the industry available for immediate delivery. All other Mini-Circuits' mixers are available with TX screening and testing.

quality control

how Mini-Circuits achieves high reliability



environmental specifications

All MCL components are manufactured under exacting quality assurance and control standards. They will meet or exceed published specifications over the operating temperature range of -54°C to $+100^{\circ}\text{C}$, and after being subjected to any or all of the following physical or environmental tests of MIL-STD 202E which are applicable.

TEMPERATURE CYCLING:	
– 65° to $+125^{\circ}\text{C}$	102 C
ALTITUDE: 656,000 feet	105 G
(2) HUMIDITY: 90% RH, 65°C	106

THERMAL SHOCK:	
– 65°C to $+125^{\circ}\text{C}$	107 B
(1) (2) SEAL: Less than 10^5 Atm. cc/sec	112 A
DROP: Random, 45 min.	203
VIBRATION:	
2 to 2,000 cps, 20g, 12 hrs.	204 D
SOLDER HEAT: 260°C , 10 sec.	210 B
(1) SOLDERABILITY: 95% coverage	208
TERMINAL TENSILE STRENGTH:	
4½ lbs., 10 sec.	211 A
(1) TERMINAL FATIGUE: 2 lbs., 3 cycles	211 C
MECHANICAL SHOCK: 100g, 6ms	213 I
SOLVENT RESISTANCE:	
Alcohol, Trichloroethan, Freon	215

NOTE:

(1) These specifications do not apply to coaxial connector models.

(2) Exceptions are non-hermetic case styles 6, 38, 46.

absolute maximum ratings

OPERATING AND STORAGE TEMPERATURE -55°C to $+100^{\circ}\text{C}$

eliminating guesswork in systems design



CAPD (computer-automated performance data)

Today, RF and Microwave subsystem and system designs must be more precisely detailed as performance demands become more stringent. Radars must be more accurate, communications systems must be more noise-free, and guidance systems must be more rigorous, and all are required to meet quality and reliability levels considered unattainable a decade ago. These new demands place a heavy burden on the design engineer, the project manager, the quality assurance group...and the suppliers of the components to be assembled into these systems. In addition to the stricter performance and reliability specs, the designer faces escalating costs if, at the last stages before system delivery, unexpected surprises occur in the form of spurious signals, high VSWR or other pitfalls not anticipated.

Until now, the designer selected his RF/Microwave components, such as mixers, power splitters, and amplifiers, using manufacturers' data sheets to provide detailed specs, performance curves, and environmental ratings. Indeed, the design engineer did receive a workable package of information to see how his design might proceed...but it was not a detailed, close-up look. The reason is simple—it has just been too expensive to take an enormous number of test points, at a considerable number of specific frequencies, tabulate the results and then repeat at other input levels.

As an example, a two-tone intermodulation distortion chart for mixer performance would require at least 100 measurement points plus 10 additional calibration points and would take an experienced technician at least a half-day to complete.

For those customers who required their data at specific frequencies or under conditions other than is offered on the manufacturers' data sheets, extra charges were justifiably added to offset the additional labor costs.

Now, a new computer-automated performance data (CAPD) service offered exclusively by Mini-Circuits to its customers at no additional charge. Based on over 20 years of RF test experience and six years of engineering manpower-hours, the CAPD service provides detailed specs never available previously on mixer conversion loss, isolation, VSWR and intermod; for directional couplers and power splitters, details on insertion loss, isolation, phase unbalance and VSWR vs. frequency; for amplifiers, VSWR, gain changes and compression point vs frequency. In fact, all Mini-Circuits' products are available with CAPD specs.

test setup is self checking

The heavy investment in CAPD, using a Hewlett-Packard Model 85 computer and HP8566A spectrum analyzer as key elements, allows the previously-mentioned, two-tone IM test to be completed in less than ten minutes compared with the manually performed sequence requiring 4-5 hours. Here's how stringent the computer-automated set up dictates each measurement: each point is measured three times, with a maximum allowable deviation of less than 0.05 dB between the three; otherwise the test is repeated. Before each measurement is taken, the computer checks the reference voltage level for any variation due to line voltage, temperature, etc., changes and compensates as required. Similarly, frequency is monitored before each test and any drift is automatically corrected. Such continuous and rapid inspection and correction ensure highly-reliable CAPD data. And, by using a large number of closely-spaced frequency points for component measurement, effects of narrow-band suck-outs or resonances (often missed with manual test procedures) are immediately identified.

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a close-up view of performance

What's the significance of CAPD to the designer? Is it a sales "gimmick" or is it truly a design tool? Review these points and judge for yourself.

A competent RF/Microwave design engineer, drawing on his experience and expertise over years of varied projects, still must be concerned with unforeseen problems when the prototype is first turned on. Generation of spurious signals, changes in dc offset level, affects of LO drive variations and other vexing problems often become evident to extend delivery time and escalate costs. In many instance, a more precise definition of the component specs could have pinpointed the potential problem areas; with CAPD, it's now possible.

Let's assume you are specifying a double-balanced mixer for a wideband front-end design. Here are a number of profound questions you face:

- In a wideband design, the local oscillator (LO) output might vary over the band and could fall below the level required by the mixer spec. Should you spend additional money to flatten LO output or do you boost LO output if it is not sufficient?... Wouldn't it be valuable to know exactly how performance will be affected since you might find performance acceptable without any additional investment? with CAPD, a close point-by-point printout of key parameters as a function of LO level is available (fig. 1) — now you can make your decision based on a close-up, view of LO drive effects on mixer performance.
- How about VSWR over the full range of receiver specs? Generally, mixer VSWR specs are given at one particular frequency. With manual-test procedures, it's a time-consuming task for the components manufacturer or systems house; with CAPD it's available at no extra charge (fig. 2).
- How does the filter in the design match the mixer IF output and what is the impedance match in-band as well as out-of-band where spurious responses become a threat? CAPD VSWR data tells it all. How will the mixer conversion loss affect receiver sensitivity over the full frequency range? And, how will flatness of conversion loss affect the degree of image rejection in an image-reject mixer? CAPD data (fig. 1) will pinpoint these details.
If the mixer is being used as a phase detector, it may be critical to know how dc offset voltage varies with frequency. Most mixer specs list dc offset at only one frequency; with CAPD, this parameter is given over the full range of frequency (fig. 4).
- Harmonic and intermod signals invariably plague your final design. The effects of, for example, a 4th

harmonic of the LO mixing with the 5th harmonic of the RF is given on many spec sheets, but at a specific LO and RF level. The effects of LO level changes might be crucial to your design; with manual point-by-point testing, extensive and costly technician test time would be demanded or, more likely, such tests just won't be performed. With CAPD capabilities, such intricate interactions are quickly run, and made available to the designer (fig. 3).

If you are specifying directional couplers and/or power splitter/combiners in your systems, you can now closely examine how VSWR, insertion loss, isolation and amplitude/phase unbalance vary at closely-spaced points over the frequency range of interest, (fig. 5). You can now evaluate the effects of the VSWR of the termination at the S-port and, another industry-first, inspect intermod data of a power splitter caused by saturation of the cores within the unit.

Amplifier performance is clearly shown with CAPD data as a function of dc power supply changes, (fig. 6). You'll be able to closely examine how VSWR, compression point and gain are influenced by dc supply fluctuations; this could reduce your power-supply costs, since it will conveniently point to the degree of voltage regulation required to meet the amplifier performance needed. Also, it's common to furnish amplifier specs over the frequency band of interest, but CAPD testing offers an opportunity to examine the amplifier characteristics, outside the band to foresee the effects of harmonic and spurious signals; for example, an amplifier that is flat to 1200 MHz offers what gain and what VSWR for second-harmonic 2400 MHz signals? Knowing these details can thwart potential systems problems.

Even a relatively common component such as an RF transformer is now available with CAPD data, (fig. 7). The significance...previously insertion loss vs frequency was considered flat over a specified frequency range. With closely spaced CAPD test prints, even slight variations which could affect systems performance become apparent.

CAPD is your microscope

Look at CAPD as a microscope, revealing the "real world" details affecting your design decisions. Most important, CAPD was involved with one uppermost objective—to assist you, the design engineer, in producing a more effective end product. To accomplish this, you may require CAPD data at very specific frequency points not provided by our programmed steps. Not to worry...just furnish us with precise needs for your specific application. Be assured we'll do our best to comply.

eliminating guesswork in systems design



CAPD (computer-automated performance data)

SRA-1 mixer

mixer conversion loss and isolation

RF (MHz)	RF-Level (dBm)	LO (MHz)	C-LOSS (dB)				L-R (dB)				L-I (dB)			
			LO +1dBm	LO +4dBm	LO +7dBm	LO +10dBm	LO +1dBm	LO +4dBm	LO +7dBm	LO +10dBm	LO +1dBm	LO +4dBm	LO +7dBm	LO +10dBm
10.00	-14.97	40.00	6.84	6.21	5.48	5.73	48.83	51.66	56.57	56.14	48.48	51.72	56.14	55.84
35.78	-14.92	65.78	7.32	6.68	5.71	5.91	49.28	51.47	54.93	54.83	48.04	50.90	54.75	53.93
61.56	-14.97	91.56	6.96	6.30	5.82	5.76	49.31	50.86	53.42	51.81	48.16	49.62	52.86	51.92
87.34	-14.96	57.34	6.99	6.38	5.77	5.86	49.40	51.62	54.58	55.74	48.70	50.97	54.02	54.69
113.12	-14.96	83.12	6.65	6.73	5.66	6.01	49.23	51.39	54.09	52.15	48.11	50.40	53.81	52.37
138.90	-14.95	108.90	6.10	5.52	5.81	5.05	49.03	50.58	52.04	50.35	48.10	48.84	51.56	50.73
164.68	-14.96	134.68	6.49	5.56	5.77	5.16	48.24	49.50	48.19	48.13	47.47	48.08	48.20	48.64
190.46	-15.02	160.46	6.14	5.41	5.62	5.01	47.61	48.20	46.85	46.44	46.51	47.18	46.27	46.53
216.24	-14.96	186.24	6.03	5.49	5.85	5.11	47.27	45.80	44.88	45.34	44.96	46.25	44.72	45.78
242.02	-14.99	212.02	7.11	6.53	5.91	6.05	46.49	44.25	43.74	43.47	44.64	44.80	43.20	43.56
267.80	-14.92	237.80	6.88	6.33	5.79	5.87	45.17	43.44	42.49	42.93	44.18	44.21	42.27	43.21
293.58	-14.96	263.58	7.08	6.61	6.01	6.17	42.69	42.29	40.93	40.87	42.63	42.74	40.33	40.79
319.36	-15.00	289.36	6.97	6.41	6.03	6.04	41.59	40.77	38.59	39.64	41.75	41.10	39.70	39.51
345.14	-14.97	315.14	7.41	6.71	5.99	6.26	39.60	39.02	37.93	37.84	41.39	40.74	38.97	38.82
370.92	-14.95	340.92	7.58	6.91	6.62	6.17	40.15	38.78	37.22	37.21	41.67	39.80	39.26	37.44
396.70	-15.00	366.70	8.22	7.42	6.93	6.39	39.81	38.10	36.79	35.84	40.85	38.81	37.86	37.46
422.48	-14.97	392.48	8.46	6.99	7.27	5.57	39.50	38.16	36.76	35.79	38.93	36.27	34.74	36.69
448.26	-14.96	418.26	9.44	7.80	7.76	6.22	39.02	37.60	36.14	36.29	38.29	36.00	34.76	33.54
474.04	-15.02	444.04	10.04	8.03	8.13	6.49	39.39	38.03	37.53	36.73	36.78	34.93	35.30	33.84
500.00	-14.92	470.00	10.31	8.43	8.10	6.84	41.24	40.71	40.19	40.14	36.15	34.30	33.89	33.63

FIG. 1

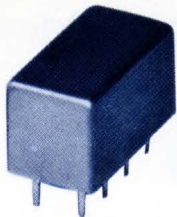
mixer VSWR

Freq. (MHz)	VSWR, RF port			VSWR, LO port			VSWR, IF port		
	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm
500	2.57		2.52	3.57		3.82	1.37		1.07
5.000	1.16			2.28			1.16		
26.789	1.06	1.08	1.25	1.41	2.28	3.09	1.43	1.19	1.09
53.079	1.12	1.13	1.24	1.33	2.10	2.99	1.41	1.24	1.14
79.368	1.18	1.18	1.27	1.37	2.08	3.24	1.46	1.29	1.21
105.658	1.30	1.23	1.43	1.37	2.13	2.82	1.73	1.37	1.37
131.947	1.35	1.29	1.46	1.42	2.16	3.01	1.77	1.47	1.45
158.237	1.41	1.35	1.49	1.47	2.12	3.07	1.82	1.54	1.47
184.526	1.48	1.42	1.53	1.46	2.12	2.73	1.96	1.67	1.59
210.816	1.53	1.47	1.57	1.53	2.16	2.83	2.09	1.74	1.67
237.105	1.78	1.53	1.80	1.53	2.19	2.77	2.67	1.82	1.99
263.395	1.81	1.62	1.84	1.57	2.19	2.61	2.60	1.95	2.00
289.684	1.65	1.70	1.66	1.64	2.19	2.72	2.23	2.07	1.83
315.974	1.82	1.76	1.78	1.67	2.22	2.52	2.74	2.16	2.08
342.263	1.88	1.83	1.84	1.79	2.32	2.55	2.94	2.25	2.21
368.553	1.96	1.87	1.90	1.77	2.40	2.56	3.15	2.29	2.35
394.842	2.00	1.92	1.91	1.70	2.43	2.44	3.11	2.36	2.31
421.132	1.75	2.02	1.71	1.66	2.43	2.54	2.47	2.48	2.00
447.421	1.91	2.04	1.85	1.61	2.40	2.44	3.15	2.41	2.35
473.710	2.06	2.03	1.94	1.57	2.35	2.39	3.56	2.35	2.47
500.000	1.94	2.07	1.85	1.47	2.32	2.37	3.12	2.37	2.30

FIG. 2

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mixer harmonic intermodulation

(Relative to desired IF Output)

Harmonic RF Order	RF CAL	LO at +4dBm														
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
0	0	—	36	17	24	24	29	33	45	49	49	65	57	59	60	65
1	0	18	—	33	18	35	31	45	40	52	50	55	58	49	63	54
2	74	42	49	41	63	45	57	57	58	55	67	69	72	72	71	70
3	78	66	40	51	35	54	38	57	57	69	63	70	70	72	72	71
4	79	68	72	66	69	63	69	63	69	71	72	67	71	70	70	71
5	78	72	71	72	65	68	59	60	59	71	70	70	70	71	71	72
6	77	70	71	71	72	73	72	73	72	71	71	72	71	70	71	70
7	78	71	69	71	71	71	72	71	71	71	71	71	72	71	72	70
8	78	72	71	71	70	71	71	70	71	72	71	72	71	71	70	72
9	80	72	72	68	70	71	71	72	72	71	71	72	71	71	71	72
10	80	71	72	71	70	72	71	71	72	73	71	70	72	72	71	72
11	79	71	72	72	72	71	70	70	71	72	72	71	73	72	72	71
12	79	71	71	72	71	72	71	71	71	71	71	71	72	71	71	70
13	78	71	71	71	70	72	71	71	71	70	71	70	72	71	71	72
14	80	72	71	72	71	71	71	71	71	70	71	71	71	72	71	72
15	73	66	73	71	71	71	71	72	72	72	70	70	71	71	73	71
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
		Harmonic LO Order														

Harmonic RF Order	RF CAL	LO at +7dBm														
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
0	0	—	31	17	27	22	28	30	39	49	46	58	57	58	59	66
1	0	17	—	37	11	33	37	47	36	50	53	60	58	59	62	61
2	74	48	47	50	52	49	60	56	58	50	69	65	72	73	72	71
3	78	66	56	58	46	57	44	68	60	64	58	72	69	72	74	72
4	79	71	71	72	70	73	69	70	72	73	73	71	72	71	73	72
5	78	73	73	72	73	73	71	72	68	72	73	72	72	71	73	72
6	77	73	71	72	71	73	73	73	73	72	73	72	74	73	73	71
7	78	73	71	72	71	73	73	73	73	72	73	72	74	73	73	71
8	78	74	72	72	71	74	74	73	71	72	73	72	72	73	73	72
9	80	74	72	73	72	72	72	73	73	73	72	73	72	74	73	72
10	80	73	74	73	71	73	73	73	73	72	73	73	74	72	73	74
11	79	71	73	73	72	72	72	71	73	72	74	73	73	73	75	72
12	79	73	73	72	74	72	73	72	72	73	74	72	71	72	73	73
13	78	73	73	73	73	72	73	73	71	72	72	72	73	72	73	71
14	80	73	72	73	73	73	73	73	71	72	72	71	72	73	73	72
15	73	66	73	72	73	73	73	73	73	73	72	71	71	73	73	72
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
		Harmonic LO Order														

Harmonic RF Order	RF CAL	LO at +10dBm														
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
0	0	—	26	13	25	16	21	21	34	43	38	61	48	54	50	54
1	0	19	—	42	10	30	30	39	34	49	50	52	58	57	59	60
2	74	63	53	71	59	58	62	58	59	54	71	66	71	73	73	74
3	78	69	63	70	69	73	64	72	72	70	63	71	71	73	74	74
4	79	72	73	74	72	73	73	74	73	72	72	71	72	73	72	73
5	78	72	72	74	74	74	72	73	73	72	72	72	73	73	73	72
6	77	71	72	73	72	73	73	72	73	74	73	72	72	72	72	73
7	78	72	72	71	73	72	73	73	74	73	73	74	72	71	73	72
8	78	72	71	72	72	72	74	73	73	73	73	73	71	72	73	73
9	80	74	71	71	71	72	73	73	71	73	73	71	73	73	72	73
10	80	73	73	72	72	74	72	73	71	74	74	73	74	71	74	73
11	79	73	73	72	73	73	73	71	70	74	73	72	72	74	74	73
12	79	73	73	73	73	73	73	72	71	73	74	73	73	72	72	71
13	78	73	73	74	72	73	72	73	72	72	71	73	74	72	73	73
14	80	72	73	72	74	74	74	73	71	72	73	71	72	72	74	73
15	73	66	73	73	73	72	73	73	73	72	73	73	72	72	73	72
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
		Harmonic LO Order														

test conditions

RF = 400.1 MHz at -10dBm

LO = 370.01 MHz

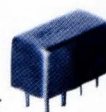
For other test frequencies, contact factory.

FIG 3

eliminating guesswork in systems design



CAPD (computer-automated performance data)



SRA-1 mixer

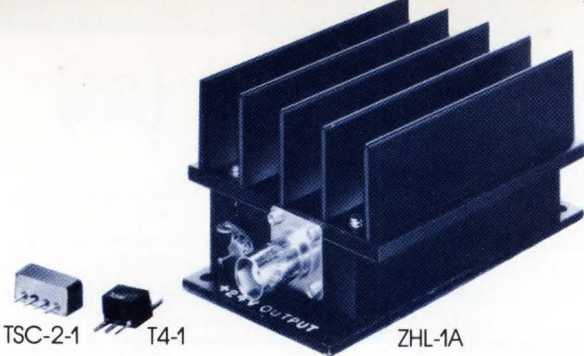
mixer phase detection (+7 dBm) model SRA-1

max. output/DC offset Vs. freq.

output voltage Vs. phase, 10 MHz

Freq. (MHz)	max. DC output mV	DC offset mV	Phase, degrees	output, mV
10.00	-262.53	- .57	0 deg.	-262 mVOLT
30.42	-263.46	- .54	10 deg.	-258 mVOLT
50.83	-260.71	- .54	20 deg.	-246 mVOLT
71.25	-260.38	- .51	30 deg.	-227 mVOLT
91.67	-264.70	- .46	40 deg.	-200 mVOLT
112.08	-265.05	- .42	50 deg.	-168 mVOLT
132.50	-266.23	- .38	60 deg.	-131 mVOLT
152.92	-263.79	- .34	70 deg.	-89 mVOLT
173.33	-263.92	- .34	80 deg.	-45 mVOLT
193.75	-268.92	- .37	90 deg.	0.6 mVOLT
214.17	-274.08	- .32	100 deg.	46 mVOLT
234.58	-276.75	- .33	110 deg.	90 mVOLT
255.00	-275.81	- .53	120 deg.	132 mVOLT
275.42	-270.65	- .63	130 deg.	169 mVOLT
295.83	-266.67	- .35	140 deg.	202 mVOLT
316.25	-256.71	- .52	150 deg.	228 mVOLT
336.67	-251.84	- .82	160 deg.	247 mVOLT
357.08	-236.17	- .63	170 deg.	259 mVOLT
377.50	-228.06	-1.01	180 deg.	263 mVOLT
397.92	-217.55	-1.38	190 deg.	259 mVOLT
418.33	-214.55	-1.88	200 deg.	247 mVOLT
438.75	-214.43	-1.58	210 deg.	228 mVOLT
459.17	-210.65	-1.86	220 deg.	292 mVOLT
479.58	-206.27	-2.74	230 deg.	169 mVOLT
500.00	-204.64	-2.69	240 deg.	132 mVOLT
			250 deg.	90 mVOLT
			260 deg.	46 mVOLT
			270 deg.	0.6 mVOLT
			280 deg.	-45 mVOLT
			290 deg.	-89 mVOLT
			300 deg.	-131 mVOLT
			310 deg.	-168 mVOLT
			320 deg.	-200 mVOLT
			330 deg.	-227 mVOLT
			340 deg.	-246 mVOLT
			350 deg.	-258 mVOLT
			360 deg.	-262 mVOLT

FIG. 4



power splitter/combiners model TSC-2-1

Insertion loss,
Amplitude Unbalance, Isolation

MHz	REF. (dBm)	S-1 (dB)	S-2 (dB)	Unbal. (dB)	ISO (dB)
1.00	-4.99	3.25	3.21	-.04	36.02
22.00	-4.95	3.20	3.20	0.00	46.30
43.00	-4.97	3.24	3.21	-.03	40.42
64.00	-4.99	3.25	3.25	0.00	36.77
85.00	-4.92	3.30	3.29	-.01	34.79
106.00	-4.99	3.28	3.28	0.00	33.30
127.00	-5.06	3.29	3.32	.03	32.27
148.00	-5.02	3.31	3.33	.02	31.51
169.00	-5.02	3.31	3.36	.05	30.95
190.00	-5.08	3.30	3.40	.10	30.64
211.00	-4.91	3.30	3.44	.14	30.51
232.00	-4.91	3.30	3.47	.17	30.62
253.00	-4.99	3.33	3.49	.16	31.06
274.00	-4.96	3.34	3.52	.18	31.94
295.00	-5.03	3.32	3.57	.25	33.35
316.00	-4.95	3.39	3.62	.23	35.36
337.00	-5.02	3.39	3.67	.28	39.90
358.00	-4.95	3.40	3.78	.38	45.13
379.00	-5.00	3.44	3.83	.39	40.23
400.00	-4.00	3.49	3.97	.48	32.15

VSWR

MHz	S	1	2
5.00	1.12	1.12	1.12
25.78	1.13	1.11	1.11
46.56	1.13	1.10	1.10
67.34	1.12	1.09	1.09
88.12	1.12	1.09	1.09
108.90	1.12	1.09	1.09
129.68	1.11	1.08	1.10
150.46	1.11	1.08	1.10
171.24	1.10	1.08	1.11
192.02	1.10	1.08	1.12
212.80	1.09	1.08	1.14
233.58	1.10	1.09	1.16
254.36	1.11	1.11	1.16
275.14	1.12	1.13	1.18
295.92	1.15	1.15	1.21
316.70	1.18	1.18	1.24
337.48	1.22	1.21	1.28
358.26	1.27	1.24	1.31
379.04	1.32	1.28	1.35
400.00	1.39	1.33	1.40

FIG. 5

RF transformers model T4-1

Insertion loss

MHz	REF. (dBm)	I.L. (dB)
.200	-14.95	3.29
.350	-14.92	2.34
2.001	-15.03	1.58
18.612	-14.97	1.21
37.021	-14.99	1.30
55.433	-15.03	1.37
73.843	-14.99	1.39
92.253	-15.02	1.49
100.001	-14.99	1.50
110.661	-14.96	1.67
129.070	-15.06	1.71
147.480	-14.98	1.73
165.890	-15.09	1.85
184.310	-14.93	2.04
202.720	-15.00	2.07
221.131	-15.09	2.12
239.540	-14.94	2.29
257.850	-15.06	2.43
276.359	-14.93	2.49
294.770	-15.03	2.54
299.999	-15.03	2.59
313.180	-15.03	2.71
331.590	-15.09	2.79
350.000	-14.96	2.81

REMARK: 2 units connected back to back

FIG. 7

power amplifiers model ZHL-1A

FREQ. (MHz)	GAIN (dB)				REVERSE GAIN (dB)				VSWR (IN)				VSWR (OUT)			
	12V	15V	20V	24V	12V	15V	20V	24V	12V	15V	20V	24V	12V	15V	20V	24V
2.00	17.90	18.27	18.46	18.52	29.03	29.07	28.96	28.88	1.09	1.13	1.14	1.14	1.10	1.16	1.15	1.15
28.21	17.88	18.27	18.48	18.52	29.53	29.72	29.54	29.24	1.09	1.11	1.13	1.14	1.20	1.19	1.19	1.18
54.42	17.88	18.33	18.54	18.59	29.57	29.62	29.58	29.39	1.12	1.12	1.13	1.14	1.24	1.24	1.24	1.24
80.63	17.94	18.41	18.65	18.70	29.91	29.78	29.64	29.56	1.19	1.17	1.16	1.16	1.30	1.29	1.30	1.30
106.84	17.90	18.41	18.69	18.78	29.85	30.12	29.97	29.75	1.31	1.24	1.21	1.21	1.36	1.36	1.37	1.37
133.05	17.91	18.42	18.75	18.83	30.02	30.06	30.15	29.87	1.42	1.32	1.28	1.27	1.41	1.41	1.42	1.44
159.26	17.68	18.34	18.71	18.81	30.25	30.32	30.03	30.00	1.56	1.42	1.36	1.34	1.46	1.48	1.50	1.52
185.47	17.64	18.34	18.78	18.84	30.50	30.36	30.12	29.99	1.71	1.553	1.45	1.43	1.50	1.53	1.57	1.60
211.68	17.52	18.25	18.74	18.82	30.50	30.64	30.19	30.05	1.83	1.63	1.52	1.50	1.51	1.56	1.63	1.67
237.89	17.46	18.20	18.73	18.81	30.85	30.64	30.35	30.32	1.96	1.72	1.59	1.57	1.52	1.58	1.67	1.73
264.10	17.34	18.09	18.66	18.74	30.99	30.75	30.40	30.43	2.04	1.79	1.64	1.62	1.48	1.56	1.66	1.75
290.31	17.28	18.03	18.58	18.69	31.08	30.89	30.66	30.58	2.14	1.86	1.69	1.66	1.44	1.53	1.66	1.76
316.52	17.33	18.08	18.69	18.79	30.64	30.77	30.51	30.49	2.16	1.88	1.70	1.67	1.40	1.50	1.64	1.75
342.73	17.32	18.06	18.69	18.79	30.50	30.44	30.41	30.44	2.17	1.87	1.69	1.65	1.33	1.43	1.59	1.71
368.94	17.30	18.04	18.71	18.77	30.09	30.23	30.24	30.27	2.09	1.81	1.63	1.59	1.27	1.35	1.49	1.62
395.15	17.23	18.02	18.67	18.82	29.81	29.95	29.91	30.18	2.03	1.75	1.57	1.53	1.24	1.28	1.41	1.55
421.36	17.32	18.13	18.83	18.98	29.19	29.36	29.52	29.85	1.96	1.68	1.49	1.44	1.32	1.29	1.36	1.50
447.57	17.37	18.23	18.96	19.08	28.50	28.79	29.05	29.22	1.90	1.61	1.41	1.36	1.47	1.36	1.34	1.43
473.78	17.17	18.10	18.90	19.08	27.94	28.28	28.64	28.82	1.93	1.64	1.42	1.37	1.68	1.51	1.39	1.42
500.00	17.07	18.14	19.06	19.26	27.68	27.17	28.22	28.50	2.07	1.79	1.57	1.54	1.01	1.79	1.61	1.58

FIG. 6

case style outline dimensions (inch mm)

case no.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	wt. grams	NOTES*
A01	.770 19.56	.800 20.32	.385 9.78	.400 10.16	.370 9.40	.400 10.16	.200 5.08	.20 5.08	.14 3.56	.031 .79									5.2	A1
A03	.480 12.20	.500 12.70	.390 9.91	.405 10.29	.210 5.34	.230 5.85	.100 2.54	.20 5.08	.14 3.56	.020 .51									2.3	A1
A04	.770 19.56	.800 20.32	.200 5.08	.210 5.33	.370 9.40	.400 10.16	.200 5.08	.20 5.08	.14 3.56	.031 .79									3.7	A1
A05	.770 19.56	.800 20.32	.240 6.10	.250 6.35	.370 9.40	.400 10.16	.200 5.08	.20 5.08	.14 3.56	.031 .79									3.7	A1
A06	.770 19.56	.800 20.32	.285 7.24	.310 7.88	.370 9.40	.400 10.16	.200 5.08	.20 5.08	.14 3.56	.031 .79									5.2	A1
A11	.480 12.20	.500 12.70	.240 6.10	.255 6.48	.210 5.34	.230 5.85	.100 2.54	.20 5.08	.14 3.56	.020 .51									1.9	A1
B02	.480 12.20	.500 12.70	.240 6.10	.255 6.48	.210 5.34	.230 5.85	.16 4.07	.100 2.54	.14 3.56	.20 5.08	.020 .51								1.9	A1
B13	.480 12.20	.500 12.70	.390 9.91	.405 10.29	.210 5.34	.230 5.85	.16 4.07	.100 2.54	.14 3.56	.20 5.08	.020 .51								2.3	A1
C07	.770 19.56	.810 20.58	.380 9.66	.410 10.42	.030 .77	.200 5.08	.20 5.08	.14 3.56											11.0	A1
D08	1.000 25.40	1.025 26.04	.390 9.91	.430 10.93	.500 12.70	.525 13.34	.025 .64	.300 7.62	.200 5.08	.09 2.29	.13 3.31	.150 3.81	.20 5.08	.14 3.56					8.5	A1
D09	1.000 25.40	1.025 26.04	.240 6.10	.280 7.12	.500 12.70	.525 13.34	.025 .64	.300 7.62	.200 5.08	.09 2.29	.13 3.31	.150 3.81	.20 5.08	.14 3.56					7.5	A1
E10	1.540 39.12	1.620 41.15	.380 9.66	.410 10.42	.770 19.56	.810 20.58	.030 .77	.200 5.08	.10 2.54	.20 5.08	.14 3.56								23.0	A1
F14	2.00 50.80	2.00 50.80	.75 19.05	1.00 25.40	.25 6.35	1.500 38.10	.13 3.31	.39 9.91											170.0	A4, B1, D2
F53	2.00 50.80	2.00 50.80	.75 19.05	1.00 25.40	.13 3.31	1.750 44.45	.13 3.31	.39 9.91											170.0	A4, B1, D2
G15	1.25 31.75	1.25 31.75	.75 19.05	.63 16.01	.38 9.66	.63 16.01	—	.800 20.32	.800 20.32	.76 19.31	.125 3.18	1.688 42.88	2.18 55.38	.75 19.05	.07 1.78				85.0	A4, B1, D1
H16	1.25 31.75	1.25 31.75	.75 19.05	.63 16.01	.38 9.66	1.000 25.40	.125 3.18	1.000 25.40	—	—	.125 3.18	1.688 42.88	2.18 55.38	.75 19.05	.07 1.78				70.0	A4, A5, B1 D2, D3, D4
J17	1.25 31.75	1.25 31.75	.75 19.05	.63 16.01	.38 9.66	1.000 25.40	.125 3.18	1.000 25.40	—	—	.125 3.18	1.688 42.88	2.18 55.38	.75 19.05	.07 1.78				75.0	A4 or A5 B1, D2, D3
K18	1.25 31.75	1.25 31.75	.75 19.05	.63 16.01	.38 9.66	1.000 25.40	.125 3.18	1.000 25.40	—	—	.125 3.18	1.688 42.88	2.18 55.38	.75 19.05	.07 1.78				70.0	A4 or A5 B1, C1, D2, D3
L19	1.50 38.10	1.13 28.70	.97 24.64	.50 12.70	.155 3.94	2.345 59.57	.138 3.51	.987 25.07	2.50 63.50	.10 2.54	.31 7.88	1.19 30.23	—	.66 16.77	—	—	.150 3.81		37.0	A4 or A6 B2, D6
L20	2.25 57.15	1.38 35.05	1.21 30.74	.50 12.70	.150 3.81	3.100 78.74	.138 3.51	1.238 31.45	3.25 82.55	.10 2.54	.40 10.16	1.86 47.25	—	.64 16.26	—	—	.150 3.81		74.0	A4 or A6 B2, D5
M21	1.50 38.10	1.13 28.70	.97 24.64	.50 12.70	.155 3.94	2.345 59.57	.138 3.51	.987 25.07	2.50 63.50	.10 2.54	.31 7.88	.75 19.05	1.19 30.23	.66 16.76	—	—	.150 3.81		40.0	A4 or A6 B2, C1, D6
M22	2.25 57.15	1.38 35.05	1.21 30.74	.50 12.70	.150 3.81	3.100 78.74	.138 3.51	1.238 31.45	3.25 82.55	.10 2.54	.40 10.16	1.15 29.21	1.86 47.25	.64 16.26	—	—	.150 3.81		74.0	A4 or A6 B2, C1, D5
M23	2.25 57.15	1.38 35.05	1.21 30.74	.50 12.70	.150 3.81	3.100 78.74	.138 3.51	1.238 31.45	3.25 82.55	.10 2.54	.63 16.00	1.06 26.93	1.63 41.40	.69 17.53	—	—	.150 3.81		70.0	A4 or A6 B2, C1, D6
N24	1.50 38.10	1.13 28.70	.97 24.64	.50 12.70	.155 3.94	2.345 59.57	.138 3.51	.987 25.07	2.50 63.50	.10 2.54	.32 8.13	.75 19.05	1.18 29.97	.31 7.88	.56 14.23	.81 20.58	.150 3.81		45.0	A4 or A6 B2, D6
N27	2.25 57.15	1.38 35.05	1.21 30.74	.50 12.70	.150 3.81	3.100 78.74	.138 3.51	1.238 31.45	3.25 82.55	.10 2.54	.42 10.67	1.13 28.70	1.84 46.74	.38 9.65	.69 17.53	1.00 25.40	.150 3.81		92.0	A4 or A6 B2, D7
P25	2.25 57.15	1.38 35.05	1.21 30.74	.50 12.70	.150 3.81	3.100 78.74	.138 3.51	1.238 31.45	3.25 82.55	.10 2.54	.78 19.81	1.47 37.34	—	.38 9.65	1.00 25.40	—	.150 3.81		86.0	A4 or A6 B2, D7
P26	1.50 38.10	1.13 28.70	.97 24.64	.50 12.70	.155 3.94	2.345 59.57	.138 3.51	.987 25.07	2.50 63.50	.10 2.54	.50 12.70	1.00 25.40	—	.31 7.88	.81 20.58	—	.150 3.81		42.5	A4 or A6 B2, D6
Q28	40.6 103.13	1.60 40.64	1.50 38.10	3.56 90.43	.25 6.35	.88 22.35	.36 9.15	.160 4.07	.40 10.16	.69 17.53	.58 14.73	.66 16.77	3.13 79.50	.81 20.58	.06 1.53				300.0	A5, D8

tolerance $x \pm .1$ $xx \pm .03$ $xxx \pm .015$

oz. = grams x .0353

*NOTES:

MATERIAL & FINISH

A1. Header material CRS; Pin material: #52 alloy.

Finish: electro tin hot-oil flowed, Cover material: cupro-nickel.

A4. Case material aluminum. Finish: iridite.

A5. Case material CRS. Finish: baked grey enamel over hot-tin dip.

A6. Case material aluminum. Finish: blue baked enamel over phosphoric etch per MIL-C-15328.

MOUNTING

B1. Mounting bracket available on request. Add suffix B to part number.

B2. Mounting bracket available on request. Add suffix B to part number. Add \$1.50 to unit cost.

MARKING

C1. For port markings 1, 2, and 3 see specification data sheet.

CONNECTORS

D1. Connectors: SMA Standard. BNC on request (no charge). Male SMA on request (add \$5.00 to unit cost).

D2. Connectors: please specify, unless otherwise noted; BNC is standard, TNC no charge, SMA and Type N add \$5.00 per unit. (ZAPD only, Dash - 4 units not available with BNC).

D3. For Type N or TNC connectors this dimension, "C", changes from 0.75 to 0.94 inches.

D4. Isolated BNC connectors are standard, FTB models only.

D5. Connectors: BNC standard, TNC on request (no charge).

D6. Connectors: Female SMA only. Male SMA available on request, consult factory.

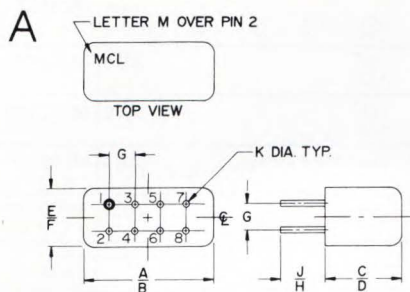
D7. Connectors: BNC only.

D8. Connectors: BNC standard, TNC on request (add \$10.00 to unit cost), Female SMA on request (add \$15.00 to unit cost).

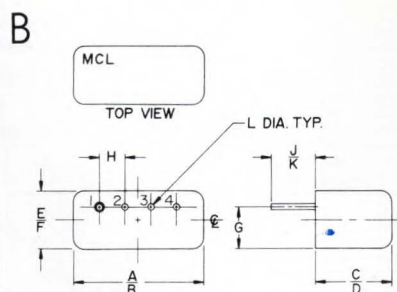
D9. Male BNC, Male N available: (add \$2.00 to unit price. Specify ports for Male connectors).

Mini-Circuits

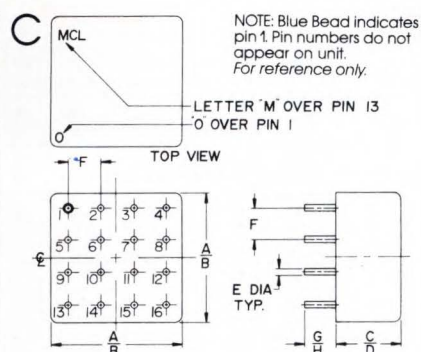
P.O. BOX 166, Brooklyn, New York 11235 (718) 934-4500



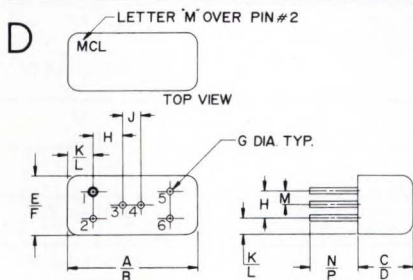
NOTE: Blue Bead indicates pin 1. Pin numbers do not appear on unit. For reference only.



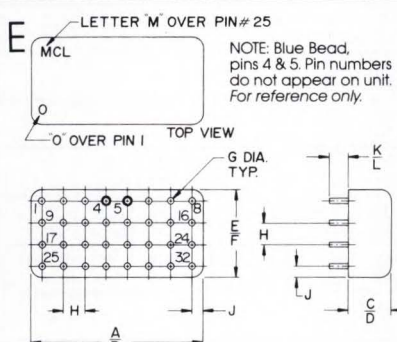
NOTE: Blue Bead indicates pin 1. Pin numbers do not appear on unit. For reference only.



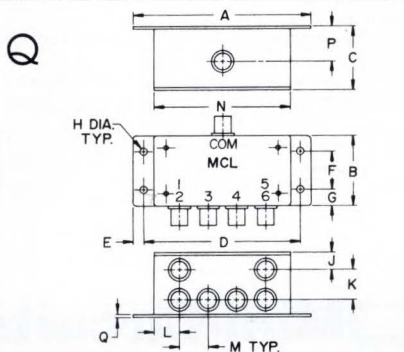
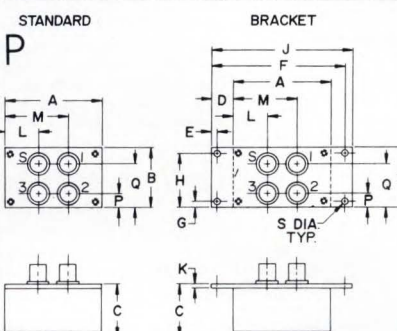
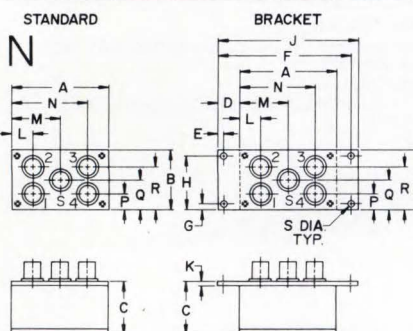
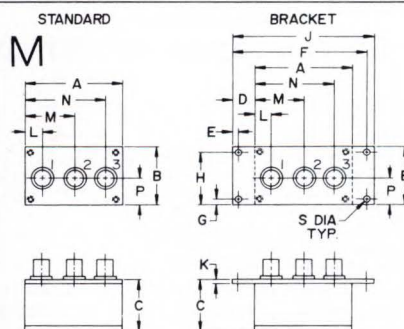
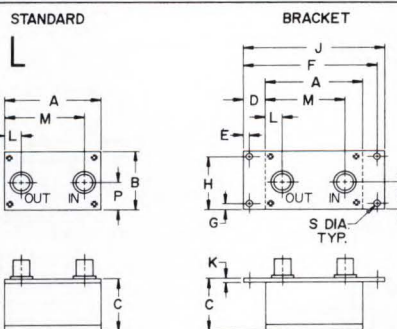
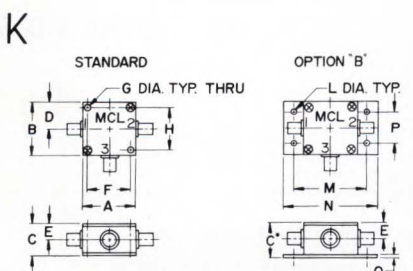
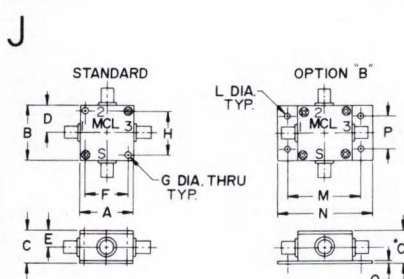
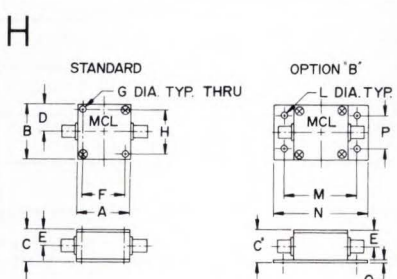
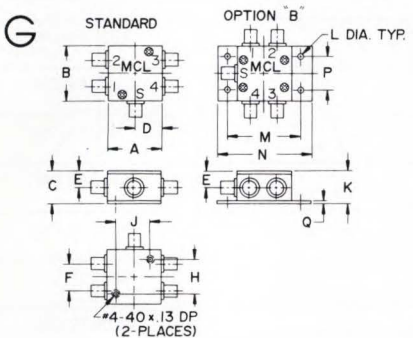
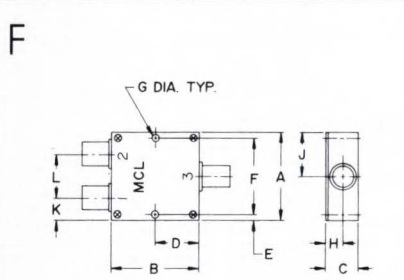
NOTE: Blue Bead indicates pin 1. Pin numbers do not appear on unit. For reference only.



NOTE: Blue Bead indicates pin 1. Pin numbers do not appear on unit. For reference only.



NOTE: Blue Bead, pins 4 & 5. Pin numbers do not appear on unit. For reference only.



case style outline dimensions (inch mm)

case no.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	wt. grams.	NOTES*
R 29	4.06 103.13	1.60 40.64	1.50 38.10	3.56 90.43	.25 6.35	.88 22.35	.36 9.15	.160 4.07	.40 10.16	.69 17.53	.58 14.73	.66 16.77	3.13 79.50	.81 20.58	.06 1.53				300.0	A1, C2, D9
R 30	6.69 169.93	1.60 40.64	1.50 38.10	6.22 157.99	.25 6.35	.88 22.35	.36 9.15	.160 4.07	.40 10.16	.69 17.53	.55 13.97	.66 16.77	5.72 145.29	.81 20.58	.06 1.53				500.0	A5, C2, D10
R 31	9.31 236.98	1.60 40.64	1.50 38.10	8.84 224.54	.25 6.35	.88 22.35	.36 9.15	.160 4.07	.40 10.16	.69 17.53	.54 13.72	.66 16.77	8.34 211.84	.81 20.58	.06 1.53				700.0	A5, C2, D11
R 67	6.69 169.93	1.60 40.64	1.50 38.10	6.22 157.99	.25 6.35	.88 22.35	.36 9.15	.160 4.07	.40 10.16	.69 17.53	1.22 30.99	.66 16.77	5.72 145.29	.81 20.58	.06 1.53				500.0	A5, C2, D12
S 32	3.75 95.25	2.00 50.80	1.8 45.7	4.83 123.15	3.375 85.73	.19 4.83	1.625 41.28	.144 3.66	.6 15.24	.4 10.16	.5 12.7	1.30 33.02	.09 2.29						220.0	A7 D20
T 34	4.75 120.65	2.00 50.80	2.21 56.14	.19 4.83	4.375 111.13	.23 5.84	1.540 39.12	.144 3.66	.58 14.73	.34 8.64	.50 12.70	1.50 38.10	1.00 25.40	.09 2.29	.38 9.65	4.00 101.60	30 7.62	2.60 66.04	440.0	A8 D20
T 35	4.75 120.65	2.00 50.80	2.46 62.49	.19 4.83	4.375 111.13	.23 5.84	1.540 39.12	.144 3.66	.58 14.73	.34 8.64	.50 12.70	1.50 38.10	1.00 25.40	.09 2.29	.38 9.65	4.00 101.60	1.50 38.10	5.00 127.00	700.0	A8 D20
U 36	7.00 177.80	3.25 82.55	2.13 54.10	.25 6.35	6.500 165.10	.38 9.65	2.500 63.50	.156 3.97	.88 22.35	.73 18.54	.63 16.01	1.13 28.70	2.23 56.64	.125 3.18	.50 12.70	6.00 152.40			900.0	A8 D6
V 37	.80 20.32	.80 20.32	.75 19.05	.40 10.16	.38 9.65	.485 12.32	.110 2.79	.485 12.32											33.0	A5, C1, D6
W 38	.30 7.62	.27 6.86	.23 5.84	.010 .25	.042 1.07	.020 .51	.100 2.54	.05 1.27	.09 2.29	.37 9.40									.50	A3
X 65	.30 7.62	.27 6.86	.23 5.84	.010 .25	.042 1.07	.020 .51	.100 2.54	.05 1.27	.04 1.02	.12 3.05	.300 7.62	.35 8.89							.50	A3
Y 39	1.25 31.75	1.25 31.75	.75 19.05	.63 16.01	.36 9.15	1.000 25.40	1.000 25.40	.125 3.18	.125 3.18	.46 11.69	2.18 55.38	1.688 42.88	.07 1.78	.750 19.05	.50 12.70	.80 20.32	.45 11.43	.29 7.37	50.0	A4, B1, D6
Z 40	7.06 179.32	3.13 79.50	.88 22.35	.65 16.51	1.750 44.45	5.310 134.87	6.810 172.97	.312 7.92	2.875 73.03	.144 3.66	3.53 89.66	.44 11.18	.415 10.54	.89 22.61					800.0	A4 or D14
AA 46	.830 21.08	.580 14.73	.265 6.73	.13 3.30	.415 10.54	.340 8.64	.025 .64	.50 12.70											6.4	A2
BB 48	.50 12.70	.39 9.91	.225 5.72	.025 .64	.07 1.79	.100 2.54	.250 6.35	.350 8.89	.06 1.53	.31 7.87									3.0	A1
CC 51	2.00 50.80	2.00 50.80	.75 19.05	.938 23.83	.13 3.30	1.750 44.45	.125 3.18	.375 9.53	1.00 25.40	1.25 31.75									120.0	A4, D14
DD 52	2.00 50.80	2.00 50.80	.75 19.05	.900 22.86	.156 3.96	1.688 42.88	.125 3.18	.392 9.96	1.00 25.40	1.25 31.75									225.0	A4, D14
EE 54	3.50 88.90	2.13 54.10	.88 22.35	.250 6.35	1.750 44.45	3.250 82.55	.250 6.35	1.813 46.05	.125 3.18	.44 11.18	.415 10.54	.89 22.61							250.00	A4, D14
FF 55	1.40 35.56	.58 14.73	.73 18.54	2.59 65.79	—	—	—	—	—	—	—	—	—	—	—	—	—	—	40.0	A9, D15
FF 56	.98 24.89	.43 10.92	.47 11.94	1.70 43.18	—	—	—	—	—	—	—	—	—	—	—	—	—	—	18.0	A9, D16
FF 57	1.54 39.12	.72 18.92	.81 20.58	3.05 77.47	.82 20.83	—	—	—	—	—	—	—	—	—	—	—	—	—	90.0	A9, D17
FF 58	1.40 35.56	.58 14.73	.61 15.50	2.59 65.79	.64 16.26	—	—	—	—	—	—	—	—	—	—	—	—	—	45.0	A9, D18

tolerance x ± .1 xx ± .03 xxx ± .015

oz. = grams x .0353

*NOTES:

MATERIAL & FINISH

- A1. Header material CRS; Pin material; #52 alloy.
- Finish: electro tin hot-oil flowed. Cover material; cupro-nickel.
- A2. Case material CRS; Pin material; #52 alloy; Covers stainless steel.
- Finish: gold flash per MIL-G-45204.
- A3. Case material plastic. Pin material; iron-nickel alloy.
- Finish: bright tin-plate per MIL-T-10727.
- A4. Case material aluminum. Finish; iridite.
- A5. Case material CRS. Finish; baked grey enamel over hot-tin dip.
- A7. Case material aluminum. Finish; black enamel. Heat Sink; black anodize.
- A8. Case material aluminum. Finish; iridite. Heat sink; black anodize.
- A9. Case material brass. Finish; nickel plate.

MOUNTING

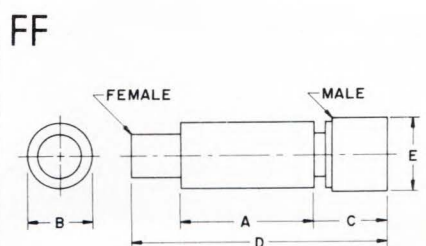
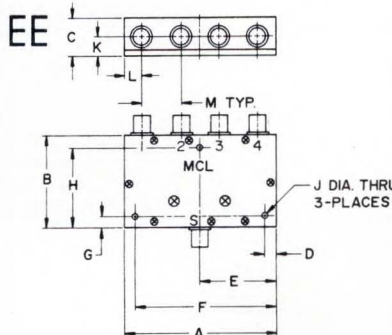
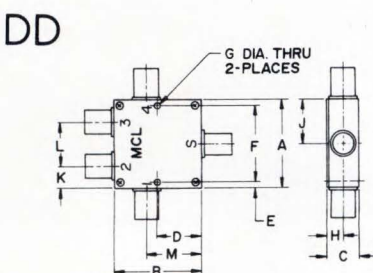
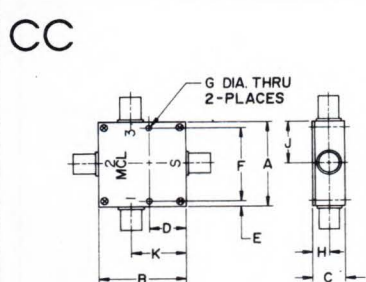
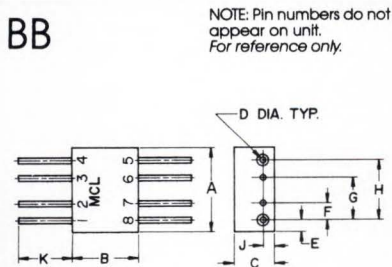
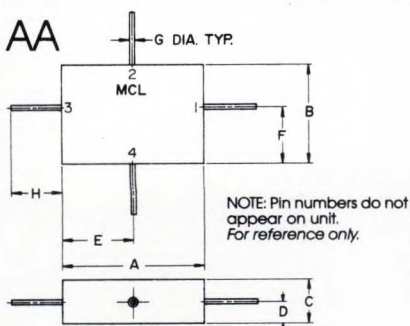
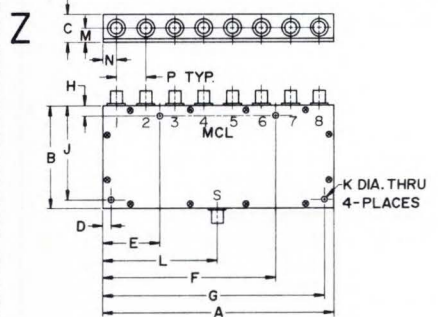
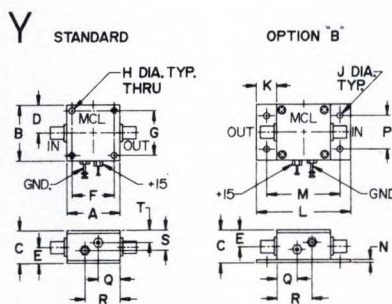
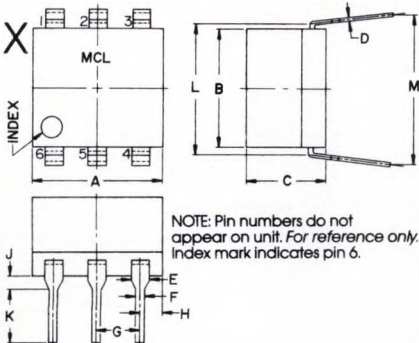
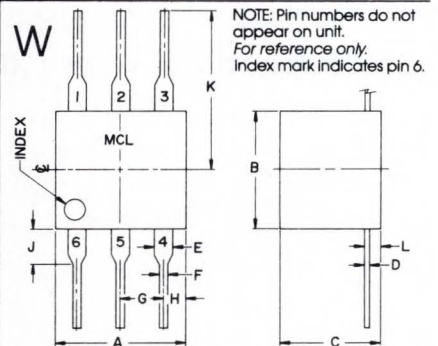
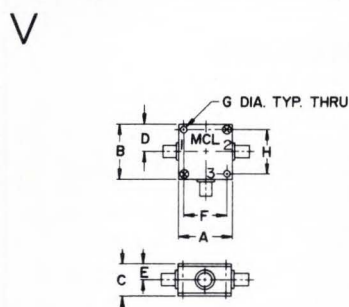
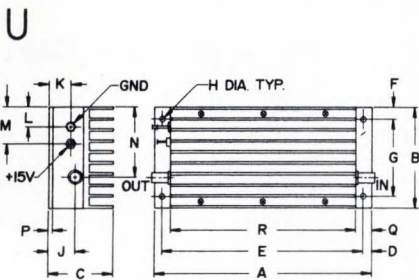
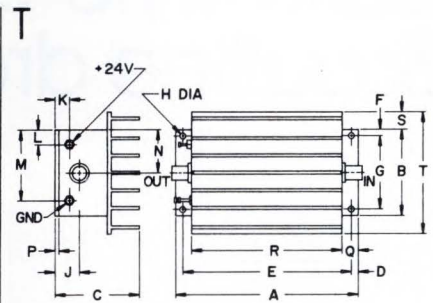
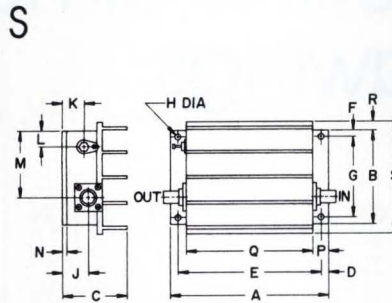
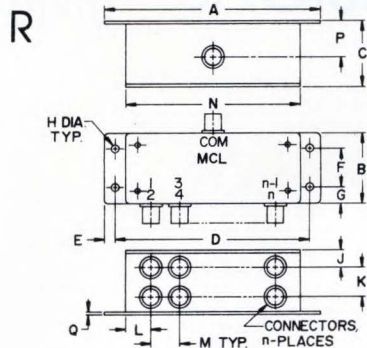
- B1. Mounting bracket available on request. Add suffix B to part number.

MARKING

- C1. For part markings 1, 2, and 3 see specification data sheet.
- C2. Consecutive marking, n = no. of way power splitter.

CONNECTORS

- D6. Connectors: Female SMA only. Male SMA available on request, consult factory.
- D9. Connectors: BNC standard, TNC on request (add \$10.00 to unit cost).
- Female SMA on request (add \$25.00 to unit cost).
- D10. Connectors: BNC standard, TNC on request (add \$20.00 to unit cost).
- SMA on request (add \$45.00 to unit cost).
- D11. Connectors: BNC standard, TNC on request (add \$35.00 to unit cost).
- SMA on request (add \$65.00 to unit cost).
- D12. Connectors: BNC standard, TNC on request (add \$15.00 to unit cost).
- SMA on request (add \$35.00 to unit cost).
- D14. Connectors: Please specify: Type N or SMA
- D15. Connectors: male BNC, female BNC standard. Other combinations with SMA available on request (add \$2.00 to unit cost).
- D16. Connectors: male SMA, Female SMA only.
- D17. Connectors: male N, female N standard. Combinations with BNC, SMA, TNC available on request (add \$3.00 to unit cost).
- D18. Connectors: male TNC, Female TNC only.
- D20. Connectors: please specify, unless otherwise noted. BNC is standard, TNC, SMA or Type N (add \$10.00 to unit cost).



case style outline dimensions & outline drawings (inch mm)

case no.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	wt. grams.	NOTES*
GG 60	2.31 58.68	1.20 30.48	.60 15.24	.125 3.18	2.062 52.38	.30 7.62	.53 13.46	.63 16.00											75.0	A4, D19
HH 68	9.31 236.47	1.60 40.64	3.57 90.68	9.84 224.54	.25 6.35	.88 22.35	.36 9.14	.160 4.06	.34 8.37	.69 17.53	.54 13.72	.66 16.76	8.34 211.84	.33 8.38	.06 1.52				1090.0	A5, D13
JJ77	1.50 38.10	1.13 28.70	.97 24.64	.50 12.70	.155 3.94	2.345 59.57	.14 3.55	.850 21.60	2.50 63.50	.10 2.54	.44 11.17	.75 19.05	.63 16.00	.37 9.39	.54 13.71	.43 10.92	.150 3.81	.73 18.54	50.0	D6
KK 81	.30 7.62	.27 6.86	.23 5.84	.010 .25	.042 1.07	.020 .51	.100 2.54	.05 1.27	.05 1.27	.035 .88	.036 .91	.26 6.60	.575 14.60						50	A3

tolerance $x \pm .1$ $xx \pm .03$ $xxx \pm .015$

oz. = grams x .0353

*NOTES:

MATERIAL & FINISH

A4. Case material aluminum. Finish: iridite.

A5. Case material CRS. Finish: baked grey enamel over hot-tin dip.

A3. Case material plastic. Pin material: iron-nickel alloy. Finish: bright tin-plate per MIL-T-10727.

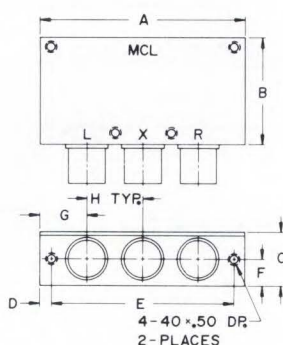
CONNECTORS

D6. Connectors: Female SMA only Male SMA available on request.

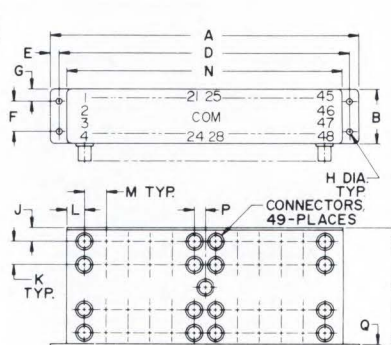
D13. Connectors: BNC standard, SMA on request (add \$130.00 to unit cost).

D19. Connectors: BNC standard, SMA on request (add \$15.00 to unit cost).

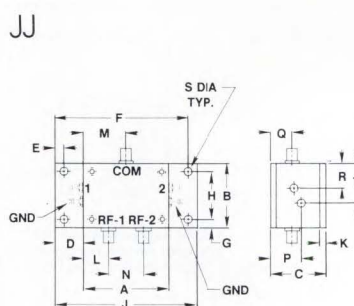
GG



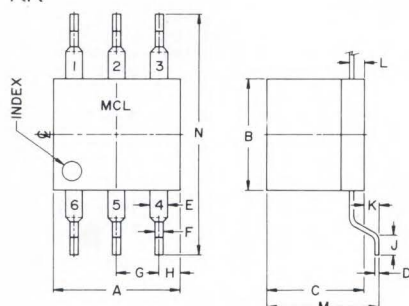
HH



JJ



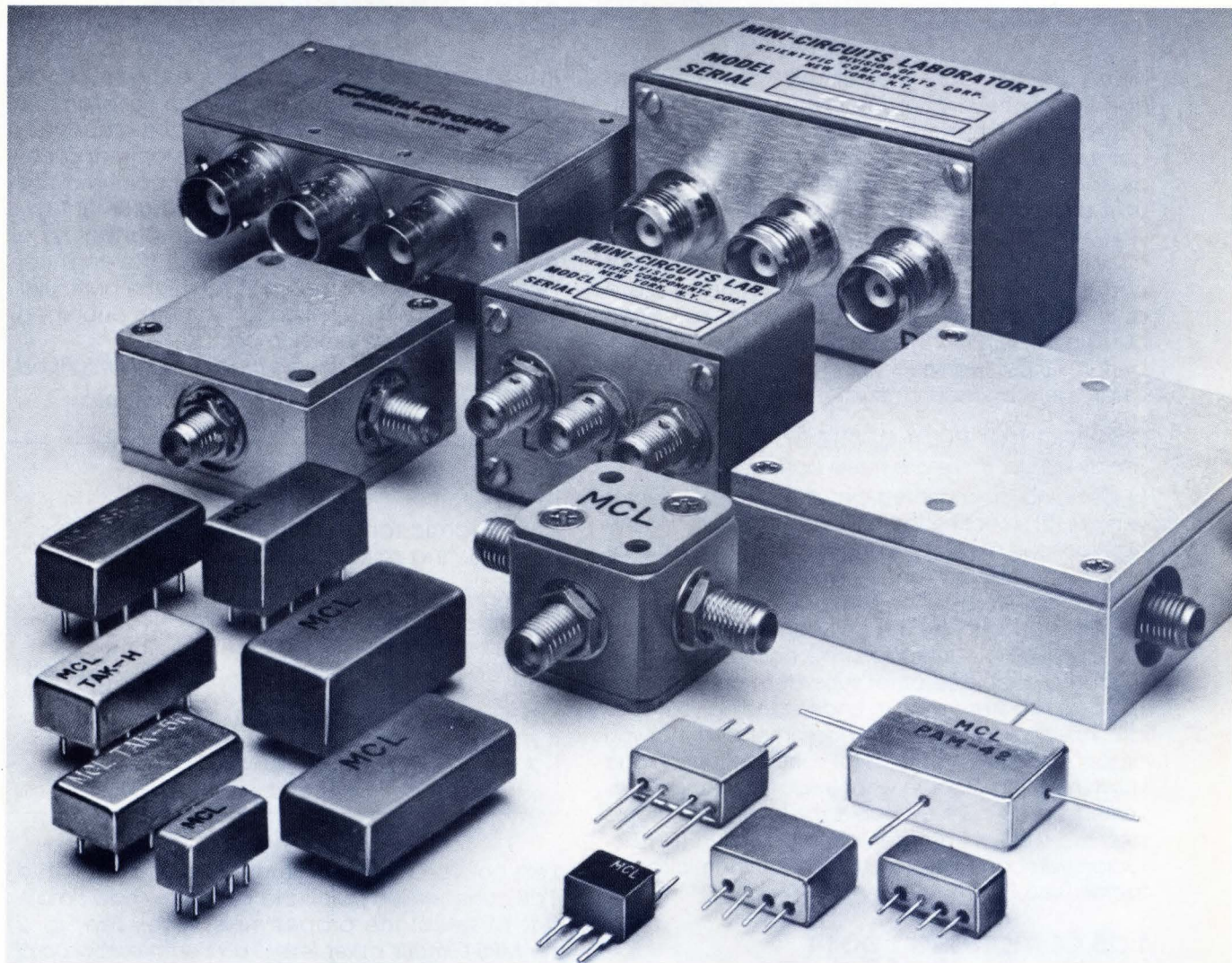
KK



world's largest selection of

Frequency Mixers

500 Hz to 4.2 GHz



LEVEL 7 to LEVEL 27 (+7dBm LO, to 27dBm LO)

As the world's largest supplier of frequency mixers, Mini-Circuits' mixers are used by over 4000 customers in well over 1000 military, space, and industrial applications including telecommunications, CATV, telephone links, satellite broadcasting, medical equipment and instrumentation.

The units offered cover 500 Hz to 4.2 GHz, and operate with the world's largest selection of LO drives ranging from +7 to +27 dBm. Available in a range of case styles from the world's smallest mixer (ASK series) to the rugged, low-cost SBL series, to the hermetically sealed TFM and compact SRA series. For high reliability, check the listing of MIL-M-28837/1A* equivalents shown on the data pages. Also check the Hi-Rel SRA-1, the industry standard... with an unprecedented 3-year guarantee. Connectorized mixers are available in various configurations, types, and connector arrangements to match your system needs.

All models shown are available from stock for immediate delivery.
*units are not QPL listed.

Mini-Circuits

P.O. BOX 166, Brooklyn, New York 11235 (718) 934-4500

mastering the mixer maze...

or selecting the right model for your application.



Mixers are abundant in electronic systems ranging from inexpensive consumer products to sophisticated military hardware. You'll find them in video games, TV sets and video cassette recorders as well as communications gear, test instruments, radar units and countermeasure systems. Mini-circuits offers well over a hundred different off-the-shelf models with thousands of variations. Different connector configurations, tighter specs, Hi-Rel options are available on request. Improper mixer selection bears a penalty—underspecify and face marginal performance; overspecify and pay extra for unnecessary performance characteristics.

making the right choice

Simply stated, there are three basic steps—

(1) deciding on a printed-circuit (PC) or connector version, (2) selecting the mixer level required in the applications, and (3) picking a model that extends over the frequency range involved. Sounds simple enough so let's examine some of the details.

The first step involves the decision on whether the mixer will be mounted to a PC board or be connected by cable to other subsystem components. The next two steps require understanding your specific needs; so it is strongly recommended that you organize the requirements for your application and put it in writing. Decide what frequency range is involved, the LO drive available, the level of harmonic and two-tone, third-order intermodulation (IM) distortion you can tolerate and other dynamic range factors, see Fig. 1.

1 dB compression point key to mixer level

What does the 1 dB compression point signify? As RF input level is increased, IF output should follow in a linear manner. However, after a certain point, IF output increases at a lower rate until mixer output becomes fairly constant. The point at which IF output deviates from linearity with RF input 1 dB is termed the 1 dB compression point. This figure is useful in comparing dynamic range, maximum output and two-tone performance of various mixers. It is a basis on which mixer level is established.

The 1 dB compression point, which defines the linearity of a mixer at high RF input levels, is relatively simple to test and thus this parameter is included on data sheets supplied by all mixer manufacturers. But,

in real life, mixer linearity may be specified in accordance with the intended application. For example, in a receiver application, two-tone, third-order intermod may be the critical parameter; for TV applications, percent distortion or intercept point may be specified; and in an attenuator measurement system, compression point may be important for a given RF input level. With this in mind, the engineer needs a convenient means to relate the particular parameter for his application with the published spec, the 1 dB compression point.

Fig. 1 lists the various ways mixer linearity might be specified.

FIG. 1

Dynamic range parameters affecting mixer selection

1. maximum RF input level anticipated
2. percent distortion acceptable
3. intercept point
4. Two-tone, 3rd order IM _____ dB
at _____ dBm, RF input
5. 1 dB RF input compression level
6. LO power available
7. none of the above specified

Let's convert every parameter with the published 1 dB compression point and then show how simple it is to select the proper mixer level, see Fig. 2 for Mini-Circuits' mixer level/1 dB compression point chart.

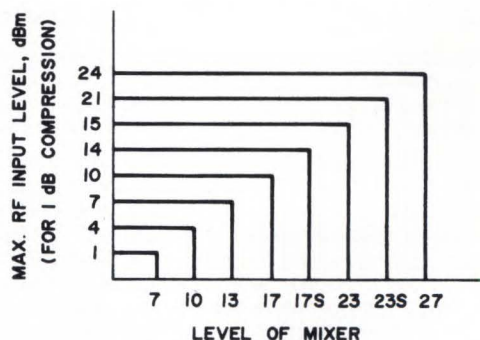


FIG. 2

THE 1 dB COMPRESSION POINT AS A FUNCTION OF THE LEVEL OF MIXER.

1. Maximum RF input level anticipated. If you know this parameter, simply select the lowest level mixer whose maximum RF input level exceeds your requirement. For example, if the maximum encountered RF level is +5 dBm, select a Level 13 mixer, rated at +7 dBm maximum RF input for 1 dB compression point.

2. Percent distortion. The percent distortion is usually specified in voltage. Thus, a 0.1% distortion figure means 0.999 of the input voltage appears at the mixer output. Next, convert this voltage ratio to a power ratio in dB by squaring and taking ten times the log. The resultant figure is the amount of compression for the specified RF input level. Now this must be extrapolated to 1 dB compression for a corresponding RF input level. As a rule of thumb, extrapolation may be achieved by assuming a linear relationship, in dB, between compression and RF input level. So a ten-times increase in compression corresponds to a ten-times increase in RF input level.

Let's illustrate with an example using a 0.1 percent distortion spec at -10 dBm RF input level. The 0.1 percent corresponds to a 0.999 voltage output; squaring this yields 0.998 power ratio or 0.009 dB. We, therefore, know that 0.1% distortion at -10 dBm input means the maximum allowable compression is 0.009 dB. Extrapolating, using the rule-of-thumb relationship, states that 0.09 dB compression corresponds to an allowable RF of 0 dBm, and further extrapolating results in 0.9 dB compression at a maximum allowable RF input level of 10 dBm. So which mixer level is appropriate? A Level 17S, with +13 dBm RF input level at the 1 dB compression point, see Fig. 2.

3. Intercept point.

This parameter is a figure of merit corresponding to the amount of intermodulation products generated relative to the desired IF output. An intercept point can be defined for a second order, third order, fifth order, product, etc. As a rule-of-thumb, two-tone third order intercept point is approximately 15 dB above the 1 dB compression point. So, if the intercept point figure is given, merely subtract 15 dB from this figure and pick a mixer which meets the 1 dB compression point spec, see Fig. 2.

4. Two-tone, third-order intermodulation (IM).

When a two-tone, third-order IM spec is given, the intercept point can be calculated. Remember that for each 10 dB increase in signal level, there is a 20 dB degradation in two-tone, third-order product. Once the intercept point is calculated, simply subtract 15 dB from the figure to find the 1 dB compression point and select the appropriate mixer.

5. 1dB Rf input compression level.

This key parameter is listed on mixer spec sheets so merely choose the lowest level mixer that will meet the requirement.

6. LO drive.

The LO drive is critical since the function of the LO drive is to switch the mixer diodes fully on and off for

lowest distortion. So, for optimum performance, select the mixer level to match the LO drive. Mini-Circuits conveniently identifies its mixer levels by the LO drive requirement; thus a Level 7 mixer refers to a LO drive level of +7 dBm. If there are constraints on the LO power available, select the lowest level mixer closest to the available LO power. For example, if +12 dBm LO drive is available, select a Level 10 mixer.

7. No particular spec to meet.

Choose a Level 7 mixer. Why? Because it is the most popular and it offers the widest choice of models at lowest cost.

Freq. range last deciding factor

Once the mixer level has been decided, you may find a wide variety of models to exercise your decision making. You may notice models within a series with overlapping frequency ranges. Why? So you can choose the optimum mixer for your requirement. Each model within a series has a different low-frequency limit. Select a mixer with the highest low frequency limit and whose mid-band range best covers your application.

Specs on the data sheets are given in three ranges. The lower frequency range, L, covers the lowest specified frequency to one decade higher; the upper frequency range, U, covers the highest frequency to one octave lower and mid-range, M, covers the frequency between L and U. Thus, a mixer specified from 0.5 to 500 MHz could offer a low-frequency range of 0.5 to 5 MHz, an upper frequency range of 250 to 500 MHz, and a mid-range of 5 MHz to 250 MHz.

What about "Specials"?

Although most Mini-Circuits mixers are 50 ohm devices, models are available in 75 ohms. Need connector types different than those listed for standard models? No problem. Some applications require matched mixer pairs that must be amplitude (conversion loss) and phase matched. Most Mini-Circuits mixers are tested to within 0.2 dB for the entire production run. Not tight enough? Let us know your exact requirement and we'll screen and test to meet it.

In summary, contact us about "specials" and we'll do our best to satisfy your needs without excessive cost or delivery date extensions. Sometimes, "special" means shipping a quantity of mixers within a very short time span; since Mini-Circuits is the largest manufacturer of mixers in the world, this may hardly be considered "special" and you may be pleasantly surprised. Try us.

order Mini-Circuits Q&A No. 4 Now...

There's lots more to mixer specs, applications and testing. Phone or write for Mini-Circuits' Q&A #4 for a provocative question-and-answer exchange on these topics.

most widely-used

Frequency Mixers

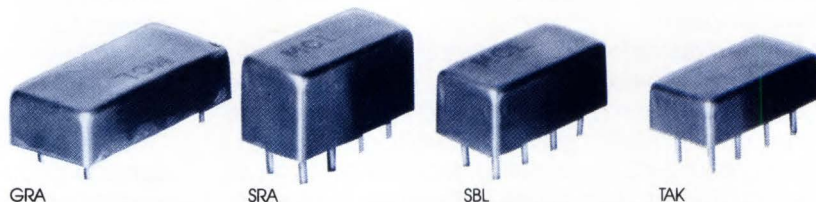
LEVEL 7 (+7 dBm LO, up to +1 dBm RF)

performance data

curves, tables, page 4 Model Index

case style selection

outline drawings see page 3



	MODEL NO.	FREQUENCY MHz		CONVERSION LOSS dB				LO-RF ISOLATION, dB						LO-IF ISOLATION, dB						PRICE, \$	
		LO/RF	IF	Mid-Band m		Total Range		L		M		U		L		M		U		Ea.	Qty.
		f_L - f_U		Typ.	Max.	Typ.	Max.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.		
GRA case D09	GRA-1	.5-500	DC-500	5.5	7.0	6.5	8.5	50	45	45	30	35	25	45	35	40	25	30	20	12.95	(6-49)
	GRA-3	.025-200	DC-200	5.5	7.5	6.5	8.5	60	50	45	35	35	25	45	35	40	30	30	20	15.95	(6-49)
	GRA-6	.003-100	DC-100	5.5	7.5	6.5	8.5	60	50	45	30	35	25	60	45	40	25	30	20	22.95	(5-24)
	GRA-8	.0005-10	DC-10	6.5	7.5	7.0	8.5	60	50	50	40	45	35	60	50	50	40	45	35	25.95	(5-24)
SRA case A01	SRA-1	.5-500	DC-500	5.5	7.0	6.5	8.5	50	45	45	30	35	25	45	35	40	25	30	20	11.95	(1-49)
	SRA-1TX	.5-500	DC-500	5.5	7.0	6.5	8.5	50	45	45	30	35	25	45	35	40	25	30	20	49.95	(1-49)
	SRA-1W	1-750	DC-750	5.5	7.5	6.5	8.5	50	45	45	30	35	25	45	30	40	25	30	20	14.95	(5-24)
	SRA-1-1	.1-500	DC-500	5.5	7.5	6.5	8.5	50	45	45	30	35	25	45	30	40	25	30	20	13.95	(5-24)
	SRA-2	1-1000	.5-500	5.5	7.5	6.5	8.5	45	30	35	20	30	20	45	30	30	20	30	20	14.95	(5-24)
	SRA-2CM	5-1000	DC-1000	6.0	7.0	6.5	8.5	60	50	35	30	30	25	50	45	30	25	25	20	14.95	(1-49)
	SRA-3	.025-200	DC-200	5.5	7.5	6.5	8.5	60	50	45	35	35	25	45	35	40	30	30	20	14.95	(5-24)
	SRA-4	.5-1250	.5-500	5.5	7.5	6.5	8.5	50	40	40	20	30	20	50	40	40	20	30	20	16.95	(5-24)
	SRA-5	5-1500	10-600	7.0	8.0	7.5	8.5	50	45	35	30	30	20	45	40	30	25	25	15	21.95	(5-24)
	SRA-6	.003-100	DC-100	5.5	7.5	6.5	8.5	60	50	45	30	35	25	60	45	40	25	30	20	21.95	(5-24)
	SRA-8	.0005-10	DC-10	6.5	7.5	7.0	8.5	60	50	50	40	45	35	60	50	50	40	45	35	26.95	(5-24)
	SRA-11	5-2000	10-600	7.0	8.5	7.5	9.0	50	45	35	25	30	20	45	40	30	20	25	15	26.95	(5-24)
case A06	SRA-12	800-1250	50-90	—	—	6.0	7.5	32	25	35	25	35	25	30	20	30	20	30	20	24.95	(5-24)
	SRA-2000	100-2000	DC-600	6.0	8.0	7.0	9.5	—	—	37	20	—	—	—	—	—	—	30	20	31.95	(1-24)
SBL case A06	SBL-1	1-500	DC-500	5.5	7.5	6.5	8.5	50	35	45	30	35	25	45	30	40	25	30	20	4.50	(10-49)
	SBL-1X	10-1000	5-500	6.0	7.5	7.0	9.0	50	35	40	25	30	20	45	30	35	20	25	20	5.95	(10-49)
TAK case A04	TAK-5	.01-250	DC-250	5.5	7.0	6.5	8.5	60	50	50	35	40	35	55	45	45	30	35	25	18.95	(1-4)
	TAK-5R	.05-200	DC-200	5.5	6.5	6.5	8.0	55	50	45	35	45	35	50	45	40	30	40	30	15.95	(5-24)
	TAK-6	.5-600	DC-600	5.5	7.5	6.5	8.5	60	50	50	30	40	25	55	45	45	30	30	20	18.95	(1-4)
	TAK-6R	5-500	DC-500	6.0	7.0	6.5	8.0	55	50	45	30	35	40	45	40	40	25	30	25	15.95	(5-24)
	TAK-7	2-1000	5-500	5.5	7.5	6.5	8.5	45	30	35	20	30	20	45	30	35	20	30	20	20.95	(1-4)

L = low range (f_L to $10 f_L$)

M = mid range ($10 f_L$ to $f_U/2$)

U = upper range ($f_U/2$ to f_U)

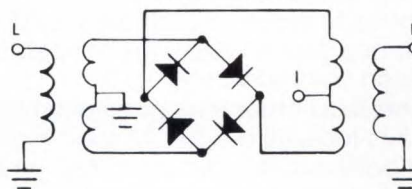
m = mid band ($2 f_L$ to $f_U/2$)

NOTES:

- HTRB tested, 3 year guarantee

- For typical characteristics, compression level, phase detection and electronic attenuation, see "Mixer Technical Section."
- For Quality Control procedures, see page 6.
- For environmental specifications see page 7.
- For High-Rel and TX description, see page 6.
- Absolute Maximum Ratings:
RF power 50 mW, peak IF current 40 mA, see pg. 7.
- Prices and specifications subject to change without notice.
- PAM-42 protected under patent 4,430,758.

schematic

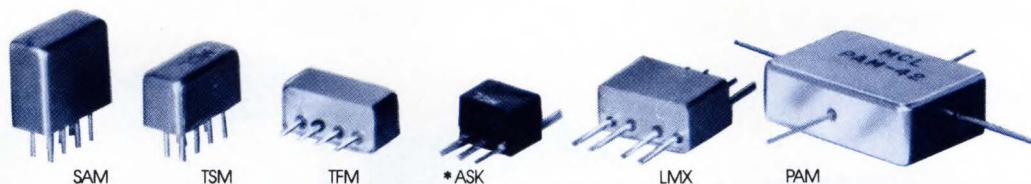


pin connections

see case style outline drawing

Series	GRA	SRA						SBL		TAK			
models	all models	-1 -1TX -1-1 -3	-2 -4	-6 -8	-1W -2cm	-5 -11 -12		-1	-1X	-5 -6	-7	-5R	-6R
LO	1	8	8	8	8	8	8	8		8	8	8	1
RF	6	1	3,4	1	1	1	1	1	3,4	1	3,4	1	8
IF	4	3,4*	1	3,4*	3,4*	3	3,4*	1		3,4*	1	3,4*	5,6*
GND	2,3,5	2,5,6,7	2,5,6,7	2,5,6,7	2,5,6,7	2,5,6,7	2,5,6,7	2,5,6,7	2,5,6,7	2,5,6,7	2,5,6,7	2,5,6,7	2,3,4,7
CASE GND	—	2	2,5,6,7	—	2,5,6,7	2,5,6,7	—	2,5,6,7		2	2,5,6,7	—	3,4,7

*pins must be connected together externally



MODEL NO.	FREQUENCY MHz		CONVERSION LOSS dB				LO-RF ISOLATION, dB						LO-IF ISOLATION, dB						PRICE, \$		
	LO/RF f _L -f _U	IF	Mid-Band m		Total Range		L		M		U		L		M		U		Ea.	Qty.	
			Typ.	Max.	Typ.	Max.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.			
SAM case A03	SAM-1	1-600	DC-600	5.5	7.0	6.5	8.5	55	45	45	30	35	20	50	40	40	25	30	20	15.95	(1-24)
	SAM-2	1-1000	DC-1000	6.0	7.5	7.0	9.5	55	45	40	25	35	20	50	40	40	25	30	25	17.95	(1-24)
	SAM-3	0.1-500	DC-500	5.5	7.0	6.5	8.5	60	50	50	35	35	30	50	40	45	30	30	20	17.95	(1-24)
	SAM-4	5-1250	0.5-1000	6.5	8.5	6.5	8.5	55	40	35	25	30	20	50	40	35	25	30	20	19.95	(1-24)
	SAM-5	5-1500	0.5-1000	6.5	7.5	6.5	8.5	55	40	35	25	30	20	50	40	35	25	30	20	24.95	(1-24)
TSM case A11	TSM-1	1-500	DC-500	6.0	7.5	6.5	8.5	60	45	45	35	35	25	55	45	40	30	35	25	17.95	(5-24)
	TSM-3	0.1-400	DC-400	5.3	7.5	6.5	8.5	60	50	50	35	35	25	55	45	45	30	35	25	19.95	(5-24)
TFM case B02	TFM-2	1-1000	DC-1000	6.0	7.5	7.0	8.5	50	45	40	25	30	25	45	40	35	25	25	20	11.95	(1-49)
	TFM-3	0.04-400	DC-400	5.3	7.0	6.0	8.0	60	50	50	35	35	25	55	40	45	30	35	25	19.95	(5-49)
	TFM-4	5-1250	DC-1250	6.0	7.5	7.5	8.5	50	45	40	30	30	25	45	40	35	25	25	20	21.95	(5-49)
case B13	TFM-11	1-2000	5-600	7.0	8.5	7.5	9.0	50	45	35	25	25	10	45	40	27	20	25	20	39.95	(1-24)
	TFM-12	800-1250	50-90	—	—	6.0	7.5	35	25	35	25	35	25	30	20	30	20	30	20	39.95	(1-24)
ASK case W38	ASK-1	1-600	DC-600	5.5	7.0	6.0	8.5	50	40	35	25	30	20	45	35	30	20	25	15	5.95	(10-49)
LMX case BB48	LMX-113	5-1000	DC-1000	6.5	7.0	7.0	8.0	50	40	40	30	35	25	45	35	35	30	30	20	14.95	(6-24)
	LMX-124	0.5-500	DC-500	5.5	6/5	6.0	7.0	50	40	45	30	45	25	45	40	40	30	30	20	22.95	(6-24)
	LMX-149	10-1500	DC-1500	6.0	7.0	6.0	10.0	55	45	45	35	30	20	50	45	40	25	20	12	24.95	(6-24)
PAM case AA46	PAM-42	2.0-4.2GHz	DC-1.3GHz	—	—	7.0	8.5	—	—	25 (typ)	17 (min)	—	—	—	—	18 (typ)	10 (min)	—	—	26.95	(1-24)

L = low range (f_L to 10 f_L)M = mid range (10 f_L to $f_U/2$)U = upper range ($f_U/2$ to f_U)m = mid band ($2f_L$ to $f_U/2$)

* Surface Mounting Available
See case KK81, page 18

SAM			TSM	TFM	ASK	LMX	PAM
-1	-4	-2	all models	all models	all models	all models	all models
-3	-5						
8	8	8	8	4	1	8	3
1	3,4	1	1	1	4	5	1
3,4*	1	3,4*	3,4*	2	5	4	4
2,5,6,7	2,5,6,7	2,5,6,7	2,5,6,7	3	2,3,6	2,3,6,7	2
2	2,5,6,7	2,5,6,7	2	3	—	2,3,6,7	2

MIL-M-288837/1A, NSN GUIDE

MCL NO.	NSN	MIL-M-288837/1A*
GRA-1		07 N
GRA-1 HI-REL		07 S
SAM-1	5895-01-117-2926	
SAM-3	5895-01-062-9973	
SAM-5	5895-01-036-9507	
SBL-1	9058-00-256-6818	
SRA-1	6625-00-008-8272	03 N
SRA-1 HI-REL		03 S
SRA-1-1	5962-01-113-5431	
SRA-1W		09 N
SRA-1W HI-REL		09 S
SRA-3	5895-01-021-5914	
SRA-6	5895-01-124-0117	
SRA-8	5985-01-081-0977	12 N
SRA-8 HI-REL		12 S
TAK-5R		01 N
TAK-5R HI-REL		01 S
TAK-6R		02 N
TAK-6R HI-REL		02 S
TFM-2-408	5821-01-076-2497	
TFM-3	5840-01-112-0031	
TSM-1	5895-01-121-7958	

*units are not QPL-listed

In Stock... Immediate Delivery

widest-variety of connector types

Frequency Mixers

LEVEL 7 (+7 dBm LO, up to +1 dBm RF)

performance data

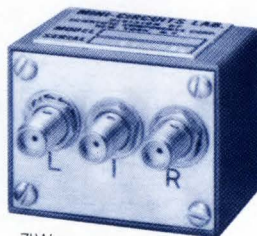
curves, tables, page 4 Model Index

case style selection

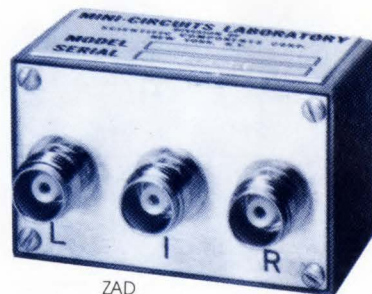
outline drawings see page 3



ZP



ZLW



ZAD
ZMA

	MODEL NO.	FREQUENCY MHz		CONVERSION LOSS dB				LO-RF ISOLATION, dB						LO-IF ISOLATION, dB						PRICE, \$		
		LO/RF f _L -f _U	IF	Mid-Band m		Total Range		L		M		U		L		M		U		Ea.	Qty.	
				Typ.	Max.	Typ.	Max.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.			
ZP case GG60	ZP10514 NEW	.2-500	DC-500	5.5	7.0	6.5	8.5	55	45	50	35	35	30	50	40	36	30	30	20	51.95	(1-49)	
ZLW case M21	ZLW-1	.5-500	DC-500	5.5	7.0	6.5	8.5	50	45	45	30	35	25	45	35	40	25	30	20	39.95	(4-24)	
	ZLW-1W	1-750	DC-750	5.5	7.5	6.5	8.5	50	45	45	30	35	25	45	30	40	25	30	20	44.95	(4-24)	
	ZLW-1-1	.1-500	DC-500	5.5	7.5	6.5	8.5	50	45	45	30	35	25	45	30	40	25	30	20	41.95	(4-24)	
	ZLW-2	1-1000	DC-1000	6.0	7.5	7.0	9.5	55	45	40	25	35	20	50	40	40	25	30	20	44.95	(4-24)	
	ZLW-3	.025-200	DC-200	5.5	7.5	6.5	8.5	60	50	45	35	35	25	45	35	40	30	30	20	41.95	(4-24)	
	ZLW-5	5-1500	5-100	6.5	7.5	6.5	8.5	55	40	35	25	30	20	50	40	35	25	30	20	51.95	(4-24)	
	ZLW-6	.003-100	DC-100	5.5	7.5	6.5	8.5	60	50	45	30	35	25	60	45	40	25	30	20	49.95	(4-24)	
	ZLW-8	.0005-10	DC-10	6.5	7.5	7.0	8.5	60	50	50	40	45	35	60	50	50	40	45	35	54.95	(4-24)	
	ZLW-11	5-2000	10-600	7.0	8.5	7.5	9.0	50	45	35	25	30	20	45	40	30	20	25	15	61.95	(4-24)	
	ZLW-12	800-1250	50-90	—	—	6.0	7.5	35	25	35	25	35	25	30	20	30	20	30	20	61.95	(4-24)	
	ZAD case M22	ZAD-1	.5-500	DC-500	5.5	7.0	6.5	8.5	50	45	45	30	35	25	45	35	40	25	30	20	29.95	(4-24)
		ZAD-1W	1-750	DC-750	5.5	7.5	6.5	8.5	50	45	45	30	35	25	45	30	40	25	30	20	34.95	(4-24)
ZAD-1-1		.1-500	DC-500	5.5	7.5	6.5	8.5	50	45	45	30	35	25	45	30	40	25	30	20	31.95	(4-24)	
ZAD-2		1-1000	.5-500	5.5	7.5	6.5	8.5	45	30	35	20	30	20	45	30	35	20	30	20	39.95	(4-24)	
ZAD-3		.025-200	DC-200	5.5	7.5	6.5	8.5	60	50	45	35	35	25	45	35	40	30	30	20	31.95	(4-24)	
ZAD-4		.5-1250	.5-500	5.5	7.5	6.5	8.5	50	40	40	20	30	20	50	40	40	20	30	20	41.95	(4-24)	
ZAD-6		.003-100	DC-100	5.5	7.5	6.5	8.5	60	50	45	30	35	25	60	45	40	25	30	20	39.95	(4-24)	
ZAD-8		.0005-10	DC-10	6.5	7.5	7.0	8.5	60	50	50	40	45	35	60	50	50	40	45	35	44.95	(4-24)	
ZAD-11		5-2000	10-600	7.0	8.5	7.5	9.0	50	45	35	25	30	20	45	40	30	20	25	15	51.95	(4-24)	
ZAD-12		800-1250	50-90	6.0	7.5	6.0	7.5	35	25	35	25	35	25	30	20	30	20	30	20	51.95	(4-24)	

L = low range (f_L to 10 f_L)

M = mid range (10 f_L to $f_U/2$)

U = upper range ($f_U/2$ to f_U)

m = mid band (2 f_L to $f_U/2$)

single-balanced (1 to 3 GHz)

MODEL NO.	LO/RF f_L - f_U	IF	Mid-Band m*		Total Range		L*		M*		U*		L*		M*		U*		Ea.	Qty.	
			Typ.	Max.	Typ.	Max.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.					
ZMA case M23	ZMA-2*	1-2.5GHz	DC-150	7.0	8.5	8.0	9.0	25	20	22	17	20	15	50	35	40	30	35	25	63.95	(1-9)
	ZMA-3*	1.4-3.0GHz	DC-500	6.5	8.0	7.0	9.0	25	20	28	18	23	15	50	35	50	30	50	30	67.95	(1-9)

*m = 500MHz

*L = f_L to ($f_L + 500$)

*M = ($f_L + 500$) to ($f_U - 500$)

*U = f_U to ($f_U - 500$)

NOTES:

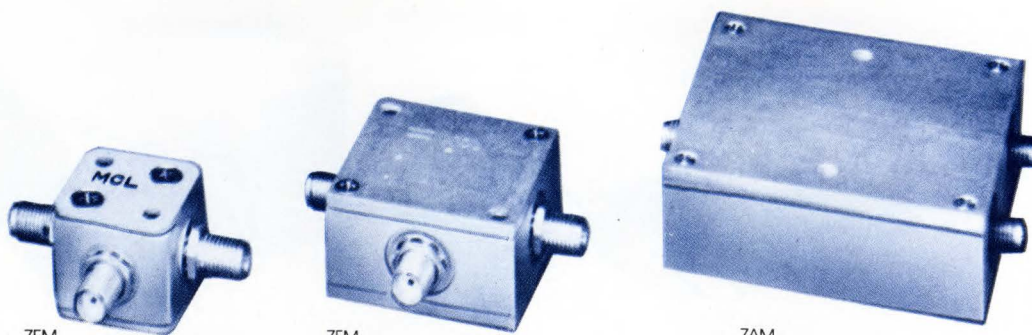
1. For typical characteristics, compression level, phase detection and electronic attenuation, see "Mixer Technical Section."
2. For Quality Control procedures, see page 6.
3. For environmental specifications see page 7.
4. For High-Rel and TX description, see page 6.
5. Absolute Maximum Ratings; RF Power 50mW, peak IF current 40mA.
6. For connector types and case mounting options, see case style outline drawing.
7. Prices and specifications subject to change without notice.

Mini-Circuits

P.O. BOX 166, Brooklyn, New York 11235 (718) 934-4500

500 Hz to 4.2 GHz

Mini-Circuits



MODEL NO.	FREQUENCY MHz		CONVERSION LOSS dB				LO-RF ISOLATION, dB						LO-IF ISOLATION, dB						PRICE, \$	
	LO/Rf	IF	Mid-Band m		Total Range		L		M		U		L		M		U		Ea.	Qty.
	f_L-f_U		Typ.	Max.	Typ.	Max.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.		
ZEM case V37	ZEM-2	10-1000 DC-1000	6.0	7.0	6.5	8.5	55	50	30	25	25	20	55	45	30	20	25	20	49.95	(4-24)
ZFM case K18	ZFM-1W	10-750 DC-750	6.0	7.0	6.2	8.0	50	45	45	30	35	25	45	40	40	25	27	20	41.95	(4-24)
	ZFM-2	1-1000 DC-1000	6.0	7.5	7.0	8.5	50	45	40	25	30	25	45	40	35	25	25	20	43.95	(1-24)
	ZFM-3	.04-400 DC-400	5.3	7.0	6.0	8.0	60	50	50	35	35	25	55	40	45	30	35	25	51.95	(1-24)
	ZFM-4	5-1250 DC-1250	6.0	7.5	7.5	8.5	50	45	40	30	30	25	45	40	35	25	25	20	51.95	(1-24)
	ZFM-11	1-2000 5-600	7.0	8.5	7.5	9.0	50	45	35	25	25	20	45	40	27	20	25	20	81.95	(1-24)
NEW ZFM case K18	ZFM-12	800-1250 50-90	—	—	6.0	7.5	35	25	35	25	35	25	30	20	30	20	30	20	71.95	(1-24)
	ZFM-2000	100-2000 DC-600	6.0	8.0	7.0	9.5	—	—	37	20	—	—	—	—	—	—	30	20	61.95	(124)
	ZFM-4212	2000-4200 DC-1300	—	—	7.0	8.5	—	—	25	17	—	—	—	—	18	10	—	—	39.95	(1-9)
ZAM case F14	ZAM-42	1500-4200 DC-500	—	—	7.0	8.5	25	20	25	17	25	20	18	10	18	10	18	10	39.95	(1-24)

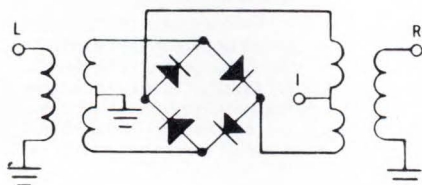
L = low range (f_L to $10 f_L$)

M = mid range ($10 f_L$ to $f_U/2$)

U = upper range ($f_U/2$ to f_U)

m = mid band ($2 f_L$ to $f_U/2$)

schematic



MIL-M-28837/1A, NSN GUIDE

MCL NO.	NSN
ZAD-1B	5895-00-280-7750
ZAD-4B	5895-01-127-0376
ZAD-6B	5865-21-200-6364
ZFM-12-1	5825-01-127-3377
ZLW-1W	5840-00-607-7010
ZLW-2B	6920-01-037-1974
ZLW-5-1	4920-01-017-2753
ZMA-3	5865-01-064-0212

coaxial connections

see case style outline drawing

Series	ZP	ZLW	ZAD (ex-2, -4)	ZAD -2, -4	ZMA	ZEM	ZFM	ZAM
models	all models	all models	all models	all models	all models	all models	all models	all models
L	L	1	1	1	1	1	1	2
R	X	3	3	2	2	2	2	1
I	R	2	2	3	3	3	3	3

In Stock... Immediate Delivery

broadband, high dynamic range

Frequency Mixers

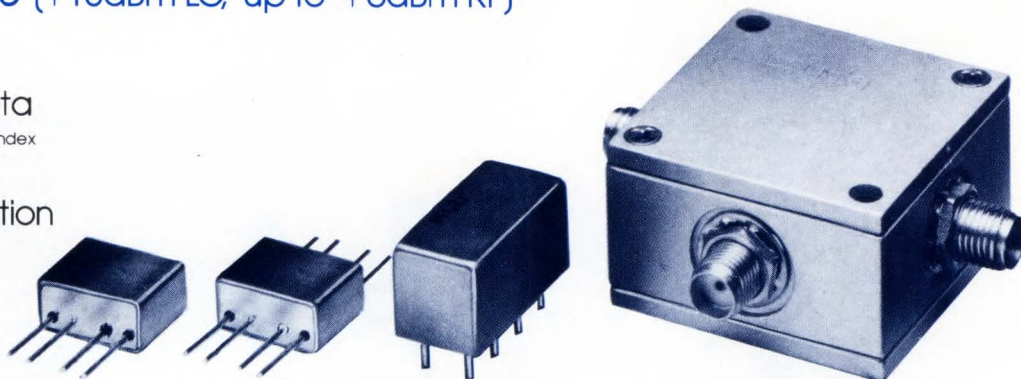
LEVEL 10 (+10dBm LO, up to +5dBm RF)

performance data

curves, tables, page 4 Model Index

case style selection

outline drawings see page 3



	MODEL NO.	FREQUENCY MHz		CONVERSION LOSS dB				LO-RF ISOLATION, dB						LO-IF ISOLATION, dB						PRICE, \$	
		LO/RF f_L-f_U	IF	Mid-Band m		Total Range		L		M		U		L		M		U		Eq.	Qty.
				Typ.	Max.	Typ.	Max.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.		
TFM case B13	TFM-15	10-3000	10-800	6.3	8.0	6.5	8.5	35	25	35	25	35	25	30	20	30	20	30	20	49.95	(1-9)
	TFM-150*	10-2000	DC-1000	6.0	8.0	6.5	8.0	32	25	35	25	35	25	33	20	30	20	30	20	39.95	(1-9)
LMX case BB48	LMX-123 NEW	10-3000	10-3000	7.5	8.0	7.5	8.5	35	25	35	20	30	15	35	25	30	25	30	20	59.95	(6-24)
	LMX-148	10-1500	DC-1500	6.0	7.0	6.0	10	45	40	35	30	25	20	40	35	35	25	20	12	24.95	(6-24)
SRA case A01	SRA-215	.05-1500	.05-500	6.0	7.5	7.0	9.0	25	20	35	25	30	20	25	20	35	25	25	15	23.95	(5-24)
	SRA-220	.05-2000	.05-500	6.0	7.5	7.0	9.0	25	20	40	30	30	20	25	20	40	30	25	15	26.95	(5-24)
ZFM case K18	ZFM-15	10-3000	10-800	6.3	7.5	6.5	8.5	35	25	35	25	35	25	30	20	30	20	30	20	79.95	(1-9)
	ZFM-150	10-2000	DC-1000	6.0	7.0	6.5	8.0	32	25	35	25	35	20	33	28	30	20	25	20	59.95	(1-9)

L=low range (f_L to $10 f_L$)

M=mid range ($10 f_L$ to $f_U/2$)

U=upper range ($f_U/2$ to f_U)

m=mid band ($2 f_L$ to $f_U/2$)

harmonic attenuation

RF CAL		MODEL TFM-15									
Harmonics RF Order		1	2	3	4	5	6	7	8	9	10
1	0	0	31	17	42	32	48	47	52	65	59
2	83	38	45	39	48	46	76	69	70	64	71
3	87	39	49	37	52	42	57	63	65	65	65
4	89	64	60	58	56	59	60	62	69	74	70
5	90	74	69	59	72	55	74	58	71	67	72
6	83	83	76	74	67	69	67	72	70	74	78
7	83	76	83	81	79	69	71	66	70	69	77
8	84	75	76	81	82	77	77	80	78	78	77
9	84	77	76	75	82	80	81	82	80	79	80
10	81	76	76	74	75	80	81	81	81	80	81

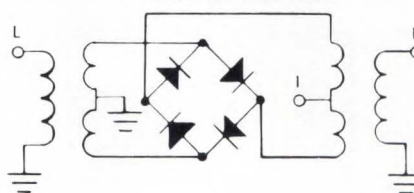
NOTES:

* Below 10 MHz IF, conversion loss increases up to 6dB higher as frequency decreases to DC.

1. For typical characteristics, compression level, phase detection and electronic attenuation, see "Mixer Technical Section."
2. For Quality Control procedures, see page 6.
3. For environmental specifications see page 7.
4. For High-Rel and TX description, see page 6.
5. Absolute Maximum Ratings.
RF power 50 mW level 10, 200mW level 13, peak IF current 40 mA, see pg. 7.
6. For connector types and case mounting options, see case style outline drawings.
7. Prices and specifications subject to change without notice.

Model: TFM-15 S/N: sample band-width: 0-99999 MHz
 999.100 MHz input P. -.06 dBm
 969.010 MHz input P. +9.96 dBm
 IF = 30.090 MHz | LO = +10 dBm, 969.01 MHz
 IF amplif. -7.14 dBm | RF = 0 dBm, 999.1 MHz
 Final Spectrum Analyzer HP-8566A Parameters:
 RES BW 1kHz VBW 3kHz
 SWP 300 msec ATTEN 10 dB 5 dB/div SPAN 100 kHz
 LO drive adjusted with 19.75db Weinschel S/N:G4047 RF,IF attenuator
 10.0dB Tektronix S/N:011-0085-00

schematic

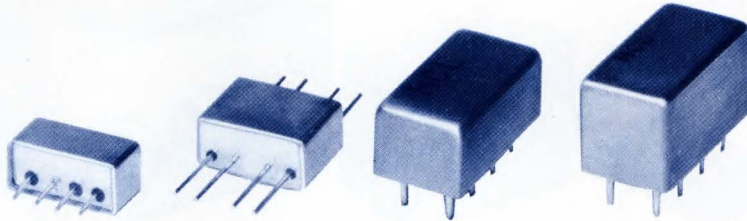


50 KHz to 3 GHz

LEVEL 13 (+13dBm LO, up to +9dBm RF)

Mini-Circuits

NEW



TFM-MH

LMX-MH

SBL-MH

SRA-MH

	MODEL NO.	FREQUENCY MHz		CONVERSION LOSS dB				LO-RF ISOLATION, dB						LO-IF ISOLATION, dB						PRICE, \$	
		LO/RF f _L -f _U	IF	Mid-Band m		Total Range		L		M		U		L		M		U		Ea.	Qty.
				Typ.	Max.	Typ.	Max.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.				
TFM-MH case B02	TFM-1MH TFM-3MH	2-500 .1-250	DC-500 DC-250	6.0 5.0	7.5 7.0	7.0 6.0	8.5 8.5	50 50	45 45	40 40	30 30	30 28	20 23	45 45	40 40	35 35	25 25	25 26	20 20	21.95 21.95	(5-24) (5-24)
LMX-MH case BB48	LMX-125MH	0.5-500	DC-500	6.0	7.0	7.0	9.0	45	40	45	40	40	30	45	40	40	35	35	25	54.95	(6-24)
SBL-MH case A06	SBL-1MH	1-500	DC-500	5.5	7.5	6.5	8.5	50	35	45	30	35	25	45	30	40	25	30	20	9.50	(10-49)
SRA-MH case A01	SRA-1MH SRA-3MH	5-500 .025-200	DC-500 DC-200	5.5 5.5	7.0 7.5	6.5 6.5	8.5 8.5	50 60	45 50	45 45	30 35	35 35	25 25	45 45	35 35	40 40	25 30	30 30	20 20	13.95 15.95	(5-24) (5-24)

L = low range (f_L to $10 f_L$)

M = mid range ($10 f_L$ to $f_U/2$)

U = upper range ($f_U/2$ to f_U)

m = mid band ($2 f_L$ to $f_U/2$)

pin and coaxial connections

see case style outline drawing

Series	TFM	LMX	SRA	ZFM	TFM-MH	LMX-MH	SBL-MH	SRA-MH
Models	all models	all models	all models	all models	all models	all models	all models	all models
LO	4	8	8	1	4	8	8	8
RF	1	5	1	2	1	5	1	1
IF	2	4	3	3	2	4	3,4*	3,4*
GND	3	2,3,6,7	2,5,6,7	—	3	2,3,6,7	2,5,6,7	2,5,6,7
CASE GND	3	2,3,6,7	2,5,6,7	—	3	2,3,6,7	—	2

*pins must be connected together externally



In Stock... Immediate Delivery

very high dynamic range

Frequency Mixers

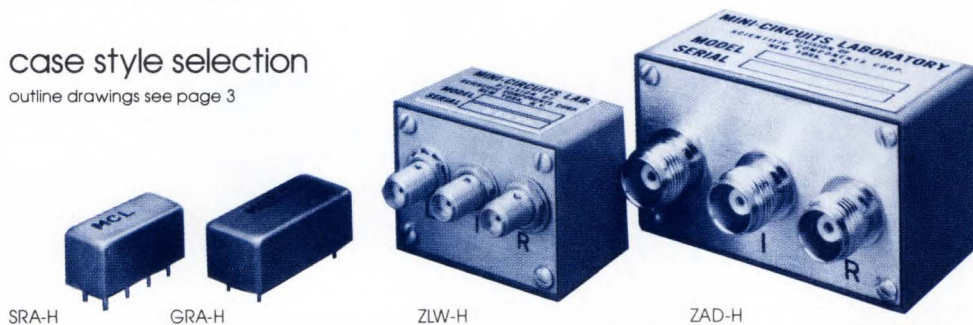
LEVEL 17 (+17 dBm LO, up to +10 dBm RF)

performance data

curves, tables, page 4 Model Index

case style selection

outline drawings see page 3



	MODEL NO.	FREQUENCY MHz		CONVERSION LOSS dB				LO-RF ISOLATION, dB						LO-IF ISOLATION, dB						PRICE, \$	
		LO/RF f _L -f _U	IF	Mid-Band m		Total Range		L		M		U		L		M		U		Ea.	Qty.
				Typ.	Max.	Typ.	Max.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.		
SRA-H case A01	● SRA-1H	.5-500	DC-500	5.5	7.5	6.5	8.5	55	45	45	30	35	25	45	35	40	30	30	20	17.95	(5-24)
	● SRA-1WH	1-750	DC-750	5.5	7.5	6.5	8.5	50	40	45	25	35	25	45	35	40	30	30	20	21.95	(5-24)
	● SRA-2H	2-1000	DC-1000	6.0	7.5	8.5	10	50	40	35	25	35	25	45	30	30	20	25	20	29.95	(5-24)
	● SRA-3H	.05-200	DC-200	5.5	7.0	5.5	7.5	50	45	40	30	35	25	45	35	40	30	30	20	19.95	(5-24)
	● SRA-11H	10-3000	10-1000	8.0	10	10	12	27	20	25	18	23	16	27	20	25	18	23	16	39.95	(1-24)
	● SRA-173H	5-1200	DC-1200	6.0	7.0	7.0	9.0	25	20	25	18	25	18	27	20	25	18	25	18	29.95	(1-5)
GRA-H case D08	● GRA-1H	.5-500	DC-500	5.5	7.5	6.5	8.5	55	45	45	30	35	25	45	35	40	30	30	20	18.95	(5-24)
	● GRA-3H	.05-200	DC-200	5.5	7.0	5.5	7.5	55	45	45	30	35	25	45	35	40	30	30	20	20.95	(5-24)
	● GRA-6H	.01-50	DC-50	5.5	6.0	5.5	7.0	50	45	45	30	35	25	50	40	47	35	32	25	26.95	(5-24)
ZLW-H case M21 SMA	● ZLW-1H	.5-500	DC-500	5.5	7.5	6.5	8.5	55	45	45	30	35	25	45	35	40	30	30	20	45.95	(4-24)
	● ZLW-1WH	1-750	DC-750	5.5	7.5	6.5	8.5	50	45	45	25	35	25	45	35	40	25	30	20	49.95	(4-24)
	● ZLW-2H	2-1000	DC-1000	6.0	7.5	8.5	10	50	40	35	25	35	25	45	35	30	20	25	20	59.95	(4-24)
	● ZLW-3H	.05-200	DC-200	5.5	7.0	5.5	7.5	55	45	45	30	35	25	45	35	40	30	30	20	47.95	(4-24)
	● ZLW-11H	10-3000	10-1000	8.0	10	10	12	27	20	25	18	23	16	27	20	25	18	23	16	91.95	(4-24)
ZAD-H case M22 BNC, TNC	● ZAD-1H	.5-500	DC-500	5.5	7.5	6.5	8.5	50	45	45	30	35	25	45	35	40	30	30	20	35.95	(4-24)
	● ZAD-1WH	1-750	DC-750	5.5	7.5	6.5	8.5	50	45	45	25	35	25	45	35	40	25	30	20	39.95	(4-24)
	● ZAD-2H	2-1000	DC-1000	6.0	7.5	8.5	10	50	40	35	25	35	25	45	35	30	20	25	20	49.95	(4-24)
	● ZAD-3H	.05-200	DC-200	5.5	7.0	5.5	7.5	55	45	45	30	35	25	45	35	40	30	30	20	37.95	(4-24)
	● ZAD-11H	10-3000	10-1000	8.0	10	10	12	27	20	25	18	23	16	27	20	25	18	23	16	81.95	(4-24)

L = low range (f_L to 10 f_L)

M = mid range (10 f_L to $f_U/2$)

U = upper range ($f_U/2$ to f_U)

NOTES:

• HTRB tested

- For typical characteristics, compression level, phase detection and electronic attenuation, see "Mixer Technical Section."
- For Quality Control procedures, see page 6.
- For environmental specifications see page 7.
- For High-Rel and TX description, see page 6.
- Absolute Maximum Ratings, RF power 200 mW, peak IF current 40 mA, see pg. 7.
- For connector types and case mounting options, see case style outline drawings.
- Prices and specifications subject to change without notice.

MIL-M-28837/1A, NSN GUIDE

MCL NO.	NSN	MIL-M-28837/1A*
GRA-1H		06N
GRA-1H Hi-Rel		06S
GRA-1H		10N
GRA-1H		10S
GRA-3H		05N
GRA-3H Hi-Rel		05S
SRA-1H	6625-00-594-0223	08N
SRA-1 Hi-Rel		08S
SRA-1WH	5840-00-576-0716	
SRA-2H	5895-01-063-1078	
SRA-3H	5895-01-117-4537	
ZAD-1WH	5895-01-045-4647	
ZLW-1H	5985-01-080-7637	
ZLW-1H-B	5962-045-7500	

*units are not GPL listed

pin and coaxial connections

see case style outline drawing

Series	SRA					GRA-H	ZLW-H	ZAD-H
Models	-1H	-1WH	-11H	-173H		all models	all models	all models
	-3H	-2H		Configuration 1	2			
LO	8	8	8	3,4*	8	1	1	1
RF	1	1	1	1	1	6	3	3
IF	3,4*	3,4*	3	8	3,4*	4	2	2
GND	2,5,6,7	2,5,6,7	2,5,6,7	2,5,6,7	2,5,6,7	2,3,5	—	—
CASE GND	2	2,5,6,7	2,5,6,7	2,5,6,7	2,5,6,7	—	—	—

*pins must be connected together externally

10 KHz to 3 GHz

Mini-Circuits



computer-automated performance data
typical production unit / for data of other models consult factory

SRA-1H

RF (MHz)	LO (MHz)	CONVERSION LOSS (dB)			ISOLATION (dB)								VSWR (+17dBm LO)		
		LO +10 dBm	LO +15 dBm	LO +17 dBm	L-R				L-I				LO	RF	IF
10.00	40.00	6.99	6.36	6.15	54.08	56.43	54.97	54.54	52.32	51.54	50.87	50.53	—	—	—
35.70	65.70	7.32	6.45	6.24	53.91	51.73	49.79	49.89	50.23	48.49	47.55	46.59	2.40	1.13	1.21
61.56	91.56	6.91	6.19	6.06	52.44	50.08	48.37	47.04	48.30	46.56	44.44	44.06	2.68	1.13	1.20
87.34	57.34	6.87	6.27	6.09	53.43	54.16	51.79	51.34	51.12	50.03	48.89	47.85	2.33	1.13	1.20
113.12	83.12	7.22	6.46	6.28	52.65	50.32	48.99	47.43	48.68	47.19	45.07	44.75	2.63	1.16	1.24
138.90	108.90	5.83	6.18	6.09	51.41	48.68	46.06	45.59	46.51	44.71	42.83	42.51	2.48	1.22	1.36
164.68	134.68	6.06	6.38	6.24	48.62	46.56	43.46	43.17	44.84	42.84	40.96	40.59	2.30	1.31	1.47
190.46	160.46	5.91	6.24	6.12	47.58	44.71	41.57	41.29	43.33	41.13	39.43	38.96	2.46	1.34	1.58
216.24	186.24	5.89	6.27	6.14	46.31	43.35	40.90	40.77	41.89	40.25	38.44	37.95	2.15	1.32	1.57
242.02	212.02	6.97	6.39	6.27	44.86	41.28	39.90	39.73	41.22	39.15	37.32	36.66	2.44	1.30	1.56
267.80	237.80	6.89	6.27	6.14	43.39	40.11	38.57	38.38	40.38	37.88	36.03	35.60	2.13	1.29	1.60
293.58	263.58	7.12	6.57	6.35	42.94	39.51	37.78	37.29	39.34	36.32	34.56	34.34	2.20	1.35	1.86
319.36	289.36	6.82	6.36	6.25	42.95	39.40	38.51	37.90	38.29	35.30	33.21	32.87	2.00	1.40	2.26
345.14	315.14	7.16	6.67	6.48	40.60	37.77	38.42	37.63	37.52	34.26	32.09	31.51	2.10	1.39	2.51
370.90	340.92	7.31	6.73	6.46	38.07	36.51	38.02	36.99	36.70	33.98	31.44	30.59	1.88	1.32	2.38
396.70	366.70	7.80	6.91	6.57	38.32	36.15	37.63	37.27	37.02	34.60	31.29	30.28	2.21	1.25	2.11
422.48	392.48	8.05	6.97	6.57	38.36	36.13	36.72	37.13	35.55	33.82	31.33	30.13	1.82	1.22	2.02
448.26	418.26	7.89	7.43	7.02	38.68	36.11	35.45	35.92	33.99	32.13	31.15	30.54	2.09	1.26	2.18
474.04	444.04	8.48	7.74	7.34	38.75	36.37	35.46	35.47	32.62	30.50	29.83	29.60	1.88	1.30	2.46
500.00	470.00	8.84	7.62	6.95	37.95	36.25	35.58	35.66	30.74	28.73	28.642	28.63	1.99	1.35	2.58

harmonic intermodulation

(Relative to desired IF Output)

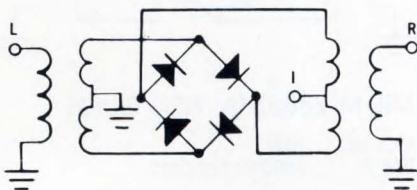
SRA-1H

Harmonics RF Order	RF CAL	RF Input power 0dBm									
		0	46	10	44	17	45	28	48	33	50
1	0	0	46	10	44	17	45	28	48	33	50
2	75	75	75	75	75	73	75	71	75	69	75
3	73	64	73	66	72	55	70	51	66	50	64
4	105	74	84	82	85	79	86	78	91	78	93
5	106	74	82	72	80	68	80	65	82	64	81
6	105	83	84	83	84	84	86	86	90	88	92
7	104	84	85	82	85	80	87	78	90	79	91
8	104	86	74	85	84	86	84	87	88	92	91
9	102	83	86	84	85	85	86	86	89	89	93
10	105	84	84	83	84	84	84	87	87	90	92
		1	2	3	4	5	6	7	8	9	10
		Harmonic LO Order									

Harmonics RF Order	RF CAL	RF Input power -10dBm									
		0	47	10	44	18	44	30	46	36	47
1	0	0	47	10	44	18	44	30	46	36	47
2	84	78	78	76	78	72	78	70	83	70	82
3	91	73	79	70	79	65	78	62	78	62	77
4	95	64	83	82	85	83	86	86	87	88	86
5	95	84	80	84	82	83	84	86	88	88	88
6	95	82	81	83	83	84	84	86	87	87	87
7	95	81	84	81	82	83	85	85	86	86	87
8	96	82	65	84	83	83	83	85	86	88	87
9	95	81	85	82	83	82	85	85	87	88	86
10	95	83	83	83	82	83	83	85	87	87	88
		1	2	3	4	5	6	7	8	9	10
		Harmonic LO Order									

test conditions RF = 10 MHz LO = 40 MHz at +17dBm
for other test frequencies, contact factory

schematic



In Stock... Immediate Delivery

very low distortion

Frequency Mixers

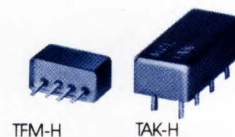
LEVEL 17S (+17dBm LO, up to +14dBm RF)

performance data

curves, tables, page 4 Model Index

case style selection

outline drawings see page 3



		FREQUENCY MHz		CONVERSION LOSS dB				LO-RF ISOLATION, dB						LO-IF ISOLATION, dB						PRICE, \$	
		MODEL NO.	LO/RF f _L -f _U	IF	Mid-Band m		Total Range	L		M		U		L		M		U		Ea.	Qty.
					Typ.	Max.		Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.				
TFM-H case B02	TFM-1H	2-500	DC-500	6.0	7.5	7.0	8.5	50	45	40	30	30	20	45	40	35	25	25	20	23.95	(5-24)
	TFM-2H	5-1000	DC-1000	6.2	7.0	7.0	10	50	45	40	30	30	20	45	40	35	25	25	17	31.95	(5-24)
	TFM-3H	.1-250	DC-250	5.0	7.0	6.0	8.5	50	45	40	30	28	23	45	40	35	25	26	20	23.95	(5-24)
case B13	TFM-4H NEW	5-1200	DC-1200	6.5	8.0	7.0	9.0	50	40	35	25	30	20	50	40	35	20	30	20	33.95	(5-24)
TAK-H case A05	TAK-1H	2-500	DC-500	6.0	7.5	7.0	8.5	50	40	40	30	30	25	45	35	35	25	25	20	19.95	(5-24)
	TAK-1WH	5-750	DC-750	6.2	7.5	7.0	9.0	50	40	40	30	30	25	45	35	35	25	30	20	23.95	(5-24)
	TAK-3H	.05-300	DC-300	5.0	7.0	6.0	8.5	55	45	40	30	30	25	50	40	35	25	25	20	21.95	(5-24)

L = low range (f_L to $10 f_L$)

M = mid range ($10 f_L$ to $f_U/2$)

U = upper range ($f_U/2$ to f_U)

m = mid band ($2 f_L$ to $f_U/2$)

NOTES:

- For typical characteristics, compression level, phase detection and electronic attenuation, see "Mixer Technical Section."
- For Quality Control procedures, see page 6.
- For environmental specifications, see page 7.
- For High-Rel and TX description, see page 6.
- Absolute Maximum Ratings:
RF power 200 mW, peak IF current 40 mA, see pg. 7.
- For connector types and case mounting options, see case style outline drawings.
- Prices and specifications subject to change without notice.

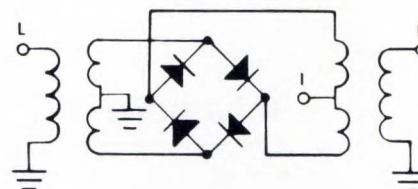
pin and coaxial connections

see case style outline drawing

Series	TFM-H	TAK-H		ZFM-H	ZLW-SH	ZAD-SH
Models	all models	-1H -3H	-1WH	all models	all models	all models
LO	4	8	8	1	1	1
RF	1	1	1	2	3	3
IF	2	3,4*	3,4*	3	2	2
GND	3	2,5,6,7	2,5,6,7	—	—	—
CASE GND	3	2	2,5,6,7	—	—	—

*pins must be connected externally

schematic

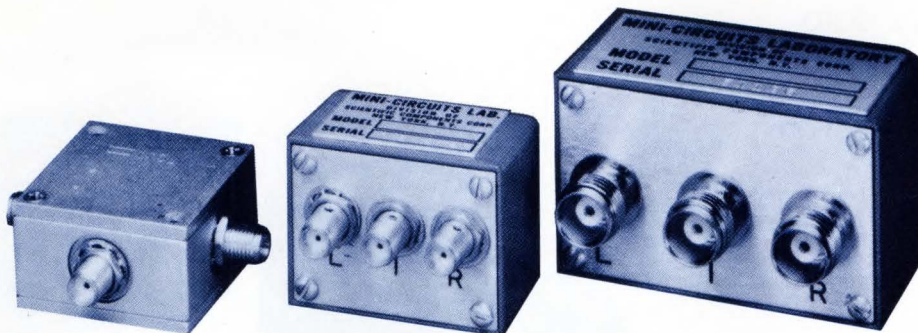


MIL-M-28837/1A, NSN GUIDE

MCL NO. NSN
TFM-1H 5895-01-129-0110

10 KHz to 1.2 GHz

Mini-Circuits



ZFM-H

ZLW-SH

ZAD-SH

	MODEL NO.	FREQUENCY MHz		CONVERSION LOSS dB				LO-RF ISOLATION, dB						LO-IF ISOLATION, dB						PRICE, \$	
		LO/RF f _L -f _U	IF	Mid-Band m		Total Range		L		M		U		L		M		U		Ea.	Qty.
				Typ.	Max.	Typ.	Max.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.				
ZFM-H case K18	ZFM-1H	2-500	DC-500	6.0	7.5	7.0	8.5	50	45	40	30	30	25	45	35	35	25	25	20	53.95	(1-24)
	ZFM-2H	5-1000	DC-1000	6.2	7.0	7.0	10	50	40	40	30	30	20	45	40	35	25	25	17	61.95	(1-24)
	ZFM-3H	.05-300	DC-300	5.0	7.0	6.0	8.5	55	45	40	30	30	25	50	40	35	25	25	20	54.95	(1-24)
ZLW-SH case M21	ZLW-1H	2-500	DC-500	6.0	7.5	7.0	8.5	50	40	40	30	30	25	45	35	35	25	25	20	50.95	(4-24)
	ZLW-1WSH	5-750	DC-750	6.2	7.5	7.0	9.0	50	45	40	30	30	20	45	40	35	25	30	20	54.95	(4-24)
	ZLW-3SH	.05-300	DC-300	5.0	7.0	6.0	8.5	55	45	40	30	30	25	50	40	35	25	25	20	52.95	(4-24)
ZAD-SH case M22	ZAD-1SH	2-500	DC-500	6.0	7.5	7.0	8.5	50	40	40	30	30	25	45	35	35	25	25	20	40.95	(4-24)
	ZAD-1WSH	5-750	DC-750	6.2	7.5	7.0	9.0	50	45	40	30	30	20	45	40	35	25	30	20	44.95	(4-24)
	ZAD-3SH	.05-300	DC-300	5.0	7.0	6.0	8.5	55	45	40	30	30	25	50	40	35	25	25	20	42.95	(4-24)

L=low range (f_L to 10 f_L)

M=mid range (10 f_L to $f_U/2$)

U=upper range ($f_U/2$ to f_U)

m=mid band (2 f_L to $f_U/2$)



computer-automated performance data

typical production unit / for data of other models consult factory

TFM-1H

RF (MHz)	LO (MHz)	CONVERSION LOSS (dB)	ISOLATION (dB)		VSWR		
			L-R	L-R	LO	RF	IF
10.00	40.00	5.89	52.26	54.10	1.59	1.15	1.33
35.78	65.78	6.15	47.79	50.70	1.67	1.10	1.34
61.56	91.56	6.24	45.16	47.94	1.51	1.09	1.34
87.34	57.34	6.16	48.87	51.91	1.53	1.08	1.35
113.12	83.12	6.03	46.18	48.52	1.57	1.08	1.35
138.90	108.90	6.29	43.89	45.76	1.57	1.08	1.36
164.68	134.68	6.13	41.75	44.17	1.55	1.08	1.37
190.46	160.46	5.89	40.42	42.16	1.50	1.07	1.38
216.24	186.24	6.13	38.76	40.87	1.51	1.07	1.40
242.02	212.02	6.00	37.29	38.89	1.47	1.07	1.41
267.00	237.80	5.86	36.41	37.32	1.47	1.06	1.42
293.58	263.58	6.12	35.27	36.40	1.48	1.06	1.44
319.36	289.36	6.03	34.46	34.97	1.44	1.05	1.45
345.14	315.14	5.94	33.99	34.19	1.48	1.05	1.48
370.92	340.92	6.01	33.19	32.90	1.47	1.04	1.50
396.70	366.70	6.00	32.52	32.93	1.45	1.04	1.52
422.48	392.48	6.19	32.12	32.12	1.48	1.04	1.56
448.26	418.26	6.39	31.50	31.13	1.47	1.05	1.57
474.04	444.04	6.22	31.48	30.35	1.50	1.05	1.61
500.00	470.00	6.44	31.93	29.87	1.47	1.06	1.64

In Stock... Immediate Delivery

ultra-low distortion

Frequency Mixers

LEVEL 23 (+23dBm LO, up to +15dBm RF)

10 KHz to 1 GHz

performance data

curves, tables, page 4 Model Index

case style selection

outline drawings see page 3



		FREQUENCY MHz		CONVERSION LOSS dB				LO-RF ISOLATION, dB						LO-IF ISOLATION, dB						PRICE, \$		
		MODEL NO.	LO/RF f _L -f _U	IF	Mid-Band m		Total Range		L		M		U		L		M		U		Ea.	Qty.
					Typ.	Max.	Typ.	Max.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.		
RAY case A01	●RAY-1	5-500	DC-500	6.0	7.5	7.5	8.5	55	45	40	30	30	25	55	45	40	30	30	20	34.95	(4-9)	
	●RAY-2	10-1000	DC-1000	7.0	8.5	8.5	10	50	35	40	30	35	25	50	35	35	25	25	20	54.95	(4-9)	
	●RAY-3	.07-300	DC-200	6.0	7.5	6.5	8.0	55	45	40	30	30	25	55	45	40	30	30	20	34.95	(4-9)	
	●RAY-6 NEW	0.01-50	DC50	5.5	7.5	6.5	8.5	60	50	45	30	35	25	60	45	40	25	30	20	31.95	(1-24)	
ZMY case M21	●ZMY-1	5-500	DC-500	6.0	7.5	7.5	8.5	55	45	40	30	30	25	55	45	40	30	30	20	57.95	(1-9)	
	●ZMY-2	10-1000	DC-1000	7.0	8.5	8.5	10	50	35	40	30	35	25	50	35	35	25	25	20	77.95	(1-9)	
	●ZMY-3	.07-300	DC-200	6.0	7.5	6.5	8.0	55	45	40	30	30	25	55	45	40	30	30	20	57.95	(1-9)	
ZAY case M22	●ZAY-1	5-500	DC-500	6.0	7.5	7.5	8.5	55	45	40	30	30	25	55	45	40	30	30	20	47.95	(1-9)	
	●ZAY-2	10-1000	DC-1000	7.0	8.5	8.5	10	50	35	40	30	35	25	50	35	35	25	25	20	67.95	(1-9)	
	●ZAY-3	.07-300	DC-200	6.0	7.5	6.5	8.0	55	45	40	30	30	25	55	45	40	30	30	20	47.95	(1-9)	

L = low range (f_L to $10 f_L$)

M = mid range ($10 f_L$ to $f_U/2$)

U = upper range ($f_U/2$ to f_U)

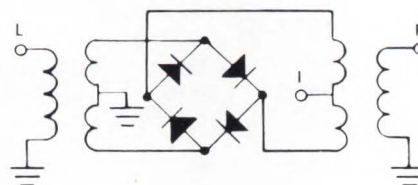
m = mid band ($2 f_L$ to $f_U/2$)

NOTES:

- HTRB tested

- For typical characteristics, compression level, phase detection and electronic attenuation, see "Mixer Technical Section".
- For Quality Control procedures, see page 6.
- For environmental specifications see page 7.
- For High-Rel and TX description, see page 6.
- Absolute Maximum Ratings: RF power 350 mW for level 23, 23S and 700 mW for level 27. Peak IF current 40 mA.
- For connector types and case mounting options, see case style outline drawing.
- Prices and specifications subject to change without notice.

schematic



pin and coaxial connections

see case style outline drawing

Series	RAY			ZMY	ZAY	SAY	ZFY	VAY
Models	-1	-2	-6	all models	all models	all models	all models	all models
LO	8	8	8	1	1	8	1	8
RF	1	1	1	3	3	1	2	1
IF	3,4*	3,4*	3,4*	2	2	3	3	3
GND	2,5,6,7	2,5,6,7	2,5,6,7	—	—	2,5,6,7	—	2,5,6,7
CASE GND	2	2,5,6,7	—	—	—	2,5,6,7	—	2,5,6,7

*pins must be connected externally

MIL-M-28837/1A, NSN GUIDE

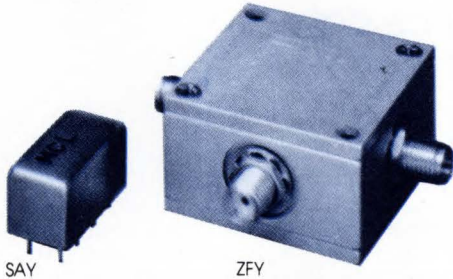
MCL NO.	NSN	MIL-M-28837/1A*
RAY-1	5825-01-105-6188	04N
RAY-1 Hi-Rel		04S
RAY-2	5895-01-111-7368	
RAY-3	5895-01-064-5082	
ZMY-2	4935-01-080-7636	

*units are not GPL listed

Mini-Circuits

P.O. BOX 166, Brooklyn, New York 11235 (718) 934-4500

LEVEL 23S (+23dBm LO, up to +20dBm RF) 100 KHz to 2.4 GHz



	FREQUENCY MHz		CONVERSION LOSS dB				LO-RF ISOLATION, dB						LO-IF ISOLATION, dB						PRICE, \$	
MODEL NO.	LO/Rf	IF	Mid-Band m		Total Range		L		M		U		L		M		U		Ea.	Qty.
	f_L - f_U		Typ.	Max.	Typ.	Max.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.		
SAY-1	0.1-500	.01-500	5.3	6.0	5.3	7.5	47	40	46	35	40	30	47	40	46	35	40	30	54.95	(1-9)
SAY-2	0.1-1000	.01-500	5.3	7.5	7.5	9.5	47	40	40	30	30	25	47	40	40	25	25	20	59.95	(1-9)
SAY-11	10-2400	5-1000	7.0	8.5	8.0	10	28	20	26	20	25	20	28	20	26	20	25	20	64.95	(1-9)
ZFY-1	0.1-500	.01-500	5.3	6.0	5.3	7.5	47	40	46	35	40	30	47	40	46	35	40	30	74.95	(1-9)
ZFY-2	0.1-1000	.01-500	5.3	7.5	7.5	9.5	47	40	40	30	30	25	47	40	40	25	25	20	79.95	(1-9)
ZFY-11	10-2400	5-1000	7.0	8.5	8.0	10	28	20	26	20	25	20	28	20	26	20	25	20	84.95	(1-9)

L = low range (f_L to $10 f_L$)

M = mid range ($10 f_L$ to $f_U/2$)

U = upper range ($f_U/2$ to f_U)

m = mid band ($2 f_L$ to $f_U/2$)

LEVEL 27 (+27dBm LO, up to +24dBm RF) 50 KHz to 500 MHz



VAY-1

MODEL NO.	FREQUENCY MHz		CONVERSION LOSS dB				LO-RF ISOLATION, dB						LO-IF ISOLATION, dB						PRICE, \$	
	LO/Rf	IF	Mid-Band m		Total Range		L		M		U		L		M		U		Ea.	Qty.
	f_L-f_U		Typ.	Max.	Typ.	Max.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.		
VAY-1 case A01	.05-500	.02-500	6.0	7.5	7.5	8.5	47	40	46	35	35	25	47	40	46	35	35	25	74.95	(1-9)

L = low range (f_L to $10 f_L$)

M = mid range ($10 f_L$ to $f_U/2$)

U = upper range ($f_U/2$ to f_U)

m = mid band ($2 f_L$ to $f_U/2$)



In Stock... Immediate Delivery

most widely-used

Frequency Mixers

LEVEL 7 (+7 dBm LO, up to +1 dBm RF)

Models

GRA-1
SRA-1
SRA-1 TX
ZLW-1
ZAD-1



computer-automated performance data
typical production unit / for data of other models consult factory

mixer conversion loss and isolation

RF MHz	LO MHz	Conversion Loss (dB)			Isolation L-R (dB)			Isolation L-I (dB)		
		LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm
.500	30.50	7.78	7.29	7.01	> 64.00	> 67.00	64.94	> 64.00	> 67.00	56.93
1.000	31.00	7.34	6.89	6.61	> 64.00	> 67.00	63.22	> 64.00	62.73	56.27
2.000	32.00	6.97	6.49	6.20	> 64.00	> 67.00	61.14	> 64.00	61.28	55.71
5.000	35.00	6.39	6.01	5.80	> 64.00	> 67.00	60.28	> 64.00	60.55	55.46
10.000	40.00	6.40	5.99	5.75	> 64.00	> 67.00	59.63	> 64.00	59.37	55.25
20.000	50.00	6.46	6.02	5.75	> 64.00	> 67.00	58.89	> 64.00	59.08	55.09
32.726	62.73	6.37	5.96	5.74	> 64.00	59.27	56.91	> 64.00	57.92	54.20
50.000	80.00	6.28	5.91	5.71	58.05	56.01	54.48	> 64.00	56.08	53.11
64.952	94.95	6.22	5.87	5.64	54.46	53.83	52.86	57.32	54.11	51.72
100.000	70.00	6.13	5.81	5.66	50.35	49.90	48.91	51.33	49.45	47.96
161.630	131.63	6.13	5.84	5.70	45.29	44.60	44.03	44.16	43.60	43.25
200.000	170.00	6.27	5.99	5.82	42.19	41.47	41.29	41.32	40.82	40.93
226.080	196.08	6.26	5.95	5.75	41.04	40.62	40.68	39.98	39.96	40.20
258.310	228.31	6.19	5.89	5.72	39.93	39.44	39.63	38.30	37.84	38.74
306.650	276.65	6.26	5.99	5.84	36.83	37.26	37.70	35.84	36.42	36.87
354.990	324.99	6.57	6.23	6.05	34.24	34.94	35.71	33.81	34.34	35.10
403.330	373.33	6.74	6.32	6.07	33.60	33.70	34.26	33.74	33.77	34.23
451.660	421.66	7.29	6.68	6.25	33.90	33.66	34.10	34.38	33.23	33.15
483.890	453.89	7.77	7.17	6.69	33.99	34.17	34.71	34.99	34.46	34.37
500.000	470.00	7.86	7.25	6.77	34.23	34.51	35.08	34.62	34.41	34.36

mixer VSWR

ϕ detection

freq. MHz	VSWR, RF port			VSWR, LO port			VSWR, IF port			max. output/DC offset vs. freq.		
	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	Freq. (MHz)	max. DC output mV	DC offset mV
5.001	1.22	1.21	1.25	1.36	1.98	2.99	1.47	1.28	1.16	10.000	-270.82	-.24
17.692	1.12	1.03	1.09	1.29	1.93	2.84	1.48	1.29	1.17	20.000	-267.82	-.23
30.384	1.10	1.02	1.09	1.30	1.96	2.82	1.48	1.30	1.18	24.000	-264.99	-.21
55.768	1.11	1.06	1.12	1.27	1.86	2.69	1.50	1.32	1.21	50.000	-261.17	-.19
81.152	1.12	1.10	1.14	1.25	1.83	2.61	1.53	1.35	1.25	80.000	-263.77	-.16
106.540	1.14	1.13	1.17	1.28	1.87	2.68	1.58	1.40	1.30	100.000	-264.35	-.15
119.230	1.16	1.15	1.19	1.29	1.88	2.67	1.60	1.43	1.33	122.000	-267.69	-.12
144.610	1.19	1.19	1.23	1.31	1.91	2.63	1.69	1.52	1.42	150.000	-263.45	-.11
170.000	1.22	1.23	1.26	1.32	1.91	2.59	1.73	1.54	1.43	178.000	-262.10	-.07
208.070	1.28	1.29	1.33	1.35	1.92	2.62	1.86	1.66	1.54	200.000	-261.22	-.13
233.460	1.33	1.35	1.38	1.39	1.91	2.59	1.96	1.74	1.62	248.000	-265.76	-.10
271.530	1.41	1.42	1.46	1.43	1.99	2.65	2.10	1.88	1.73	276.000	-270.40	-.18
296.920	1.47	1.49	1.52	1.48	1.99	2.63	2.18	1.97	1.80	304.000	-266.94	-.26
322.300	1.53	1.56	1.58	1.52	1.99	2.66	2.29	2.07	1.90	332.000	-249.96	-.23
360.380	1.62	1.65	1.68	1.62	2.03	2.64	2.45	2.19	2.03	360.000	-231.15	-.47
398.450	1.73	1.74	1.77	1.73	2.16	2.72	2.59	2.33	2.13	388.000	-211.89	-.18
423.840	1.80	1.81	1.83	1.77	2.20	2.83	2.65	2.40	2.20	430.000	-189.53	-.45
461.910	1.92	1.93	1.94	1.80	2.27	2.90	2.76	2.49	2.29	458.000	-184.41	-.03
487.300	1.99	2.00	2.00	1.82	2.25	2.87	2.81	2.53	2.32	486.000	-184.46	-.13
500.000	2.03	2.03	2.02	1.83	2.26	2.86	2.79	2.55	2.33	500.000	-181.27	-.33

Measurements at RF & LO Power +7 dBm

Mini-Circuits

P.O. BOX 166, Brooklyn, New York 11235 (718) 934-4500

mixer harmonic intermodulation

(relative to desired IF output)

RF ORDER HARMONIC	RF CAL												
	0	> 94	-	36	51	42	61	42	60	58	62	54	72
	1	> 94	23	-	39	12	46	22	51	35	56	48	72
	2	74	68	54	71	55	73	55	74	55	64	50	77
	3	81	47	41	49	40	53	42	55	42	56	44	64
	4	> 94	73	75	76	71	77	67	76	66	76	62	75
	5	> 94	70	66	67	52	71	49	66	49	71	52	65
	6	> 94	84	77	> 86	> 86	> 86	81	> 86	82	84	82	83
	7	> 94	83	65	79	65	78	75	76	60	77	55	73
	8	> 94	86	85	> 88	81	> 86	> 86	> 86	> 86	> 86	84	> 86
	9	93	87	84	86	80	82	73	85	75	86	84	78
10	> 93	> 87	> 87	86	> 87	> 88	> 88	> 86	> 86	> 86	> 86	> 86	
		0	1	2	3	4	5	6	7	8	9	10	
Harmonic LO Order													

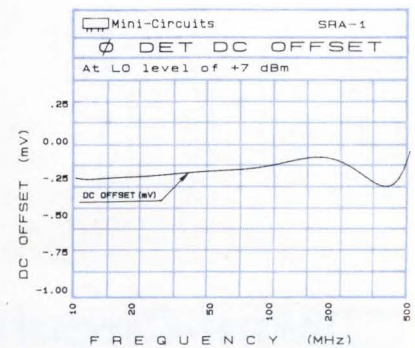
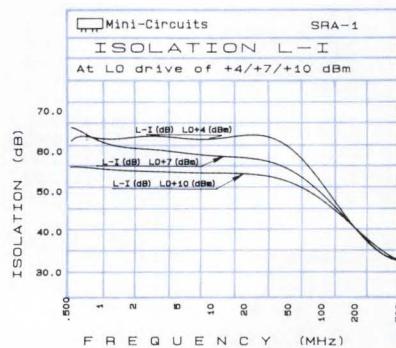
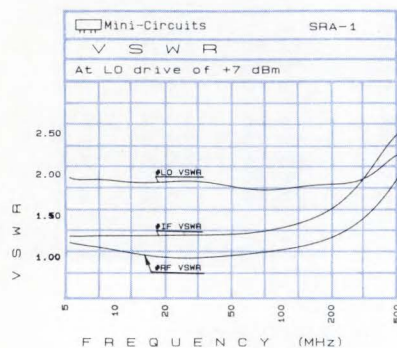
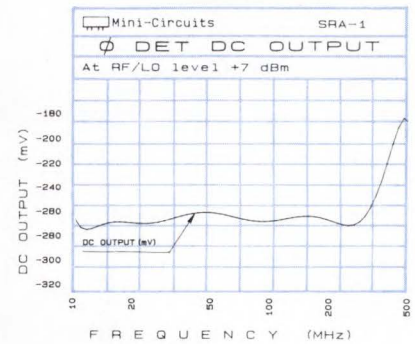
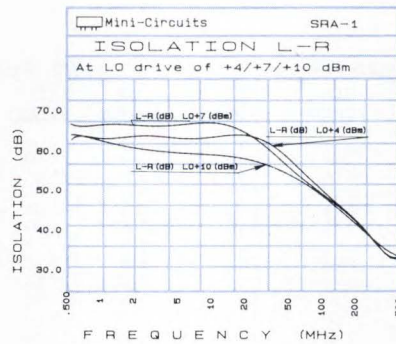
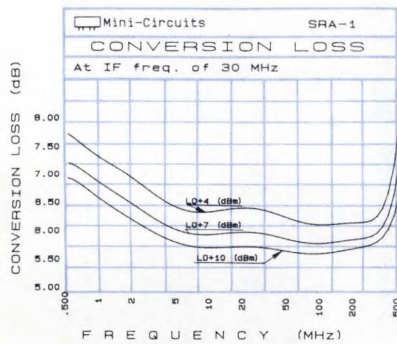
test conditions: RF=185.100 MHz INPUT P.=+0.00DBM
 LO=155.010 MHz INPUT P.=+6.92DBM
 IF=30.090 MHz IF AMPLIT.=-6.18 DBM

RF ORDER HARMONIC	RF CAL												
	0	> 84	-	28	42	28	52	27	43	30	48	35	48
	1	> 84	22	-	36	13	40	21	47	30	44	36	49
	2	82	75	60	76	60	73	59	73	58	69	49	69
	3	> 84	65	62	67	66	69	56	73	55	69	53	68
	4	> 84	> 76	> 76	> 76	> 76	> 76	> 76	> 76	> 76	> 76	> 76	> 76
	5	> 84	> 76	> 76	> 76	> 76	> 76	> 76	> 76	> 76	> 76	> 76	> 76
	6	> 84	> 78	> 76	> 76	> 76	> 76	> 76	> 76	> 76	> 76	> 76	> 76
	7	84	> 78	> 78	> 76	> 76	> 76	> 76	> 76	> 76	> 76	> 76	> 76
	8	> 84	> 78	> 78	78	> 78	> 76	> 76	> 76	> 76	> 76	> 76	> 76
	9	82	77	> 78	> 78	> 78	> 78	> 76	> 76	> 76	> 76	> 76	> 76
	10	> 82	> 76	78	78	> 78	78	> 78	> 76	> 76	> 76	> 76	> 76
0 1 2 3 4 5 6 7 8 9 10													
Harmonic LO Order													

test conditions: RF=185.100 MHz INPUT P.=+9.96DBM
 LO=155.010 MHz INPUT P.=+6.92DBM
 IF=30.090 MHz IF AMPLIT.=-15.97 DBM

typical performance curves

(production unit)



most widely-used

Frequency Mixers

LEVEL 7 (+7 dBm LO, up to +1 dBm RF)

Models

GRA-3
SRA-3
ZLW-3
ZAD-3



computer-automated performance data

typical production unit / for data of other models consult factory

mixer conversion loss and isolation

RF MHz	LO MHz	Conversion Loss (dB)			Isolation L-R (dB)			Isolation L-L (dB)		
		LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm
.025	30.03	6.51	6.32	6.11	> 64.00	61.81	62.76	> 64.00	> 67.00	> 70.00
.050	30.05	5.30	5.12	5.04	> 64.00	61.72	62.74	> 64.00	> 67.00	> 70.00
.070	30.07	5.14	4.92	4.79	> 64.00	61.54	62.53	> 64.00	> 67.00	> 70.00
.100	30.10	5.03	4.82	4.74	> 64.00	61.91	62.09	> 64.00	> 67.00	> 70.00
.500	30.50	4.93	4.77	4.65	> 64.00	62.49	62.14	> 64.00	> 67.00	> 70.00
1.000	31.00	4.80	4.62	4.57	> 64.00	62.67	62.27	> 64.00	> 67.00	> 70.00
2.000	32.00	4.81	4.62	4.54	> 64.00	63.24	62.43	> 64.00	> 67.00	> 70.00
5.000	35.00	4.82	4.62	4.55	> 64.00	63.76	62.53	> 64.00	> 67.00	> 70.00
10.000	40.00	4.84	4.63	4.54	> 64.00	63.89	62.58	> 64.00	> 67.00	> 70.00
20.000	50.00	4.94	4.73	4.60	> 64.00	61.30	60.40	> 64.00	> 67.00	> 70.00
33.750	63.75	4.83	4.68	4.53	57.85	55.93	54.70	> 64.00	> 67.00	> 70.00
50.000	80.00	4.79	4.64	4.52	51.71	51.22	50.98	> 64.00	> 67.00	> 70.00
65.417	95.42	4.78	4.67	4.54	47.21	47.30	47.63	> 64.00	> 67.00	65.96
89.167	59.17	4.70	4.57	4.53	43.02	43.43	43.96	> 64.00	60.81	60.62
100.000	70.00	4.67	4.60	4.57	41.66	40.49	41.59	58.46	60.50	60.24
120.830	90.83	4.77	4.66	4.63	39.80	40.83	41.71	57.31	56.75	57.72
152.500	122.50	4.98	4.87	4.81	35.98	36.91	38.08	53.63	54.57	56.35
184.170	154.17	5.24	5.09	4.98	34.97	36.81	38.19	50.67	52.08	53.43
192.080	162.08	5.27	5.15	5.09	34.86	36.76	37.90	49.85	51.00	53.26
200.000	170.00	5.31	5.22	5.13	35.10	37.30	38.17	49.26	51.05	52.79

mixer VSWR

φ detection

freq. MHz	VSWR, RF port			VSWR, LO port			VSWR, IF port			max. output/DC offset vs. freq.		
	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	Freq. (MHz)	max. DC output mV	DC offset mV
5.000	1.21	1.13	1.07	1.76	2.82	4.16	1.56	1.46	1.38	.025	-231.13	+ .26
10.000	1.22	1.13	1.07	1.68	2.65	3.93	1.57	1.47	1.38	.040	-237.32	+ .23
16.818	1.22	1.13	1.07	1.71	2.69	3.93	1.57	1.48	1.39	.100	-241.68	+ .20
20.000	1.22	1.13	1.06	1.73	2.72	4.05	1.58	1.48	1.39	.200	-241.66	+ .20
28.636	1.21	1.12	1.06	1.75	2.72	3.90	1.59	1.49	1.40	1.000	-245.59	+ .20
40.455	1.20	1.11	1.05	1.70	2.65	3.86	1.61	1.51	1.43	5.000	-237.45	+ .19
50.000	1.19	1.10	1.05	1.68	2.63	3.79	1.63	1.53	1.45	13.864	-235.23	+ .19
58.182	1.18	1.09	1.04	1.65	2.56	3.68	1.66	1.56	1.48	22.727	-235.03	+ .18
70.000	1.17	1.08	1.04	1.64	2.50	3.50	1.70	1.60	1.52	40.454	-235.11	+ .19
81.818	1.16	1.07	1.04	1.62	2.44	3.41	1.74	1.65	1.57	50.000	-235.70	+ .21
93.637	1.14	1.07	1.05	1.65	2.47	3.48	1.80	1.71	1.63	67.045	-236.33	+ .24
100.000	1.14	1.06	1.05	1.65	2.50	3.49	1.83	1.72	1.65	84.772	-234.74	+ .20
117.270	1.12	1.07	1.07	1.71	2.52	3.43	1.93	1.79	1.71	100.000	-231.73	+ .30
129.090	1.11	1.07	1.09	1.71	2.44	3.33	1.97	1.82	1.75	111.360	-229.31	+ .13
140.910	1.11	1.09	1.11	1.73	2.46	3.24	2.07	1.91	1.83	120.230	-228.00	+ .04
152.730	1.12	1.11	1.14	1.76	2.45	3.27	2.15	2.00	1.90	137.950	-231.37	+ .03
164.550	1.13	1.14	1.17	1.77	2.50	3.32	2.23	2.06	1.97	150.000	-232.21	- .09
176.360	1.15	1.17	1.20	1.75	2.46	3.22	2.32	2.14	2.03	164.540	-230.38	+0.00
188.180	1.18	1.20	1.24	1.73	2.38	3.13	2.41	2.22	2.12	182.270	-225.80	- .06
200.000	1.21	1.23	1.27	1.74	2.40	3.06	2.48	2.30	2.21	200.000	-223.25	+0.00

Measurements at RF & LO Power +7 dBm

Mini-Circuits

P.O. BOX 166, Brooklyn, New York 11235 (718) 934-4500

mixer harmonic intermodulation

(relative to desired IF output)

RF ORDER HARMONIC	RF CAL												
	0	-	-	38	>87	44	61	46	61	52	60	66	62
	1	-	31	-	37	11	42	18	55	24	55	31	48
	2	88	>84	73	>85	71	>86	67	79	64	>83	61	81
	3	87	52	52	51	51	50	46	51	45	50	45	52
	4	>96	>87	75	>87	76	87	74	>87	75	>88	82	>85
	5	>96	73	69	73	63	72	61	69	58	64	60	62
	6	>96	>86	81	>85	81	>88	82	>86	81	>87	81	>87
	7	>95	87	69	85	69	83	68	76	67	75	64	74
	8	>96	>86	85	>86	84	>86	84	>86	85	>86	>86	>87
	9	>95	81	74	81	75	81	73	80	72	78	71	78
	10	>95	86	>87	88	>88	>86	>87	>86	>86	>86	>86	88
	0	1	2	3	4	5	6	7	8	9	10		

Harmonic LO Order

test conditions: RF, =IN: FREQ. 10.1 MHZ DRIVE -4.01 DBM TESTED ON :16,10,84
 LO, =IN: FREQ. 40.01 MHZ DRIVE +7.03 DBM TESTED BY :D.E.
 IF =MEASURED: FREQ. 29.91 AMP. -9.13 DBM

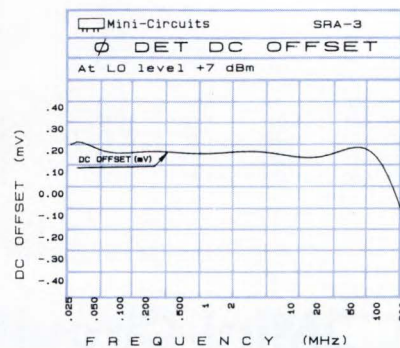
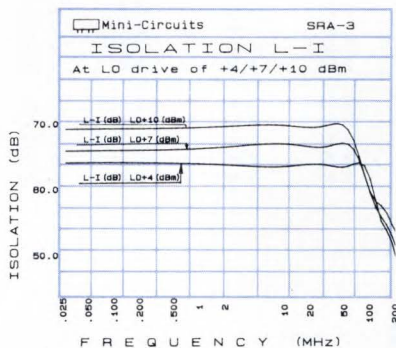
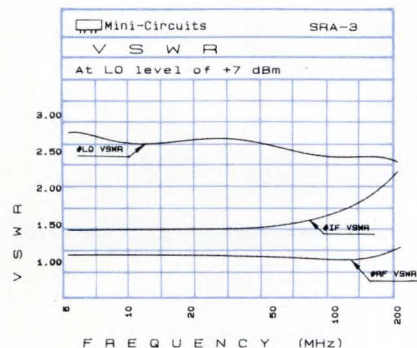
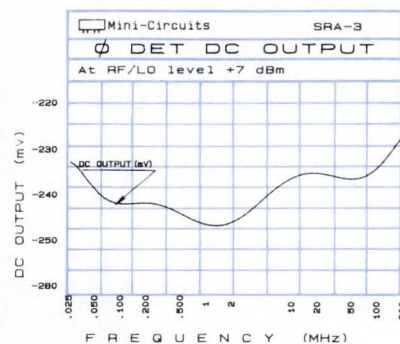
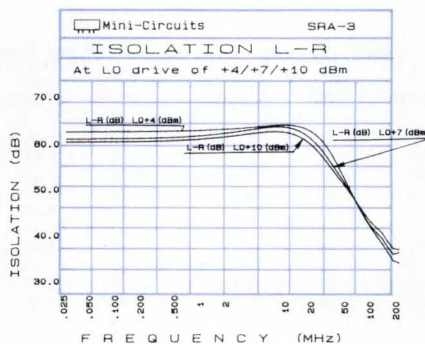
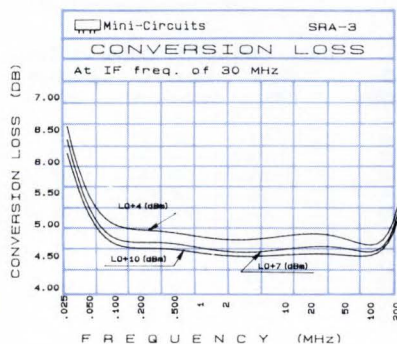
RF ORDER HARMONIC	RF CAL												
	0	-	-	28	65	34	51	35	51	38	51	43	56
	1	-	29	-	34	11	36	17	41	23	43	28	59
	2	> 95	> 76	65	75	65	> 76	64	> 77	65	> 77	72	> 76
	3	> 96	71	63	71	60	69	62	67	61	63	60	65
	4	> 96	> 77	> 76	> 77	> 75	> 76	76	> 77	> 75	> 75	> 76	> 77
	5	> 95	> 76	> 76	> 76	77	> 77	> 75	> 77	75	> 77	74	> 78
	6	> 95	> 76	> 76	> 76	> 76	> 77	> 77	> 76	> 75	> 77	> 76	> 76
	7	> 95	> 77	> 77	> 76	> 77	> 76	> 76	> 77	77	> 77	> 77	> 75
	8	> 95	> 76	> 76	> 75	> 76	> 76	> 76	> 75	> 75	> 76	> 76	76
	9	> 96	> 76	> 76	> 76	> 76	> 75	> 76	> 77	> 76	> 76	> 77	> 75
10	> 96	> 77	> 76	> 77	> 76	> 76	> 77	> 77	> 77	> 77	> 77	> 78	
	0	1	2	3	4	5	6	7	8	9	10		

Harmonic LO Order

test conditions: RF, =IN: FREQ. 10.1 MHZ DRIVE -14.03 DBM TESTED ON :16,10,84
 LO, =IN: FREQ. 40.01 MHZ DRIVE +7.08 DBM TESTED BY :D.E.
 IF =MEASURED: FREQ. 29.91 AMP. -19.1 DBM

typical performance curves

(production unit)



most widely-used

Frequency Mixers

LEVEL 7 (+7 dBm LO, up to +1 dBm RF)

Models

GRA-6
SRA-6
ZLW-6
ZAD-6



computer-automated performance data
typical production unit / for data of other models consult factory

mixer conversion loss and isolation

RF MHz	LO MHz	Conversion Loss (dB)			Isolation L-R (dB)			Isolation L-I (dB)		
		LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm
.003	30.00	6.43	6.08	5.85	> 64.00	61.88	59.98	> 64.00	63.93	62.81
.100	30.10	6.22	5.90	5.63	> 64.00	62.42	60.32	> 64.00	63.98	63.03
.200	30.20	6.22	5.92	5.52	> 64.00	62.44	60.51	> 64.00	64.17	63.17
.500	30.50	6.22	5.87	5.59	> 64.00	62.74	60.50	> 64.00	64.06	63.48
.800	30.80	6.19	5.87	5.54	> 64.00	62.70	60.52	> 64.00	64.22	63.19
1.000	31.00	6.12	5.82	5.46	> 64.00	62.48	60.50	> 64.00	64.07	63.36
2.000	32.00	6.20	5.85	5.42	> 64.00	62.34	60.33	> 64.00	63.72	63.16
5.000	35.00	6.23	5.93	5.58	> 64.00	61.61	59.62	> 64.00	63.44	61.59
10.000	40.00	6.28	5.96	5.62	58.73	56.55	55.24	59.27	56.72	55.57
20.000	50.00	6.43	6.13	5.67	50.42	49.50	49.52	50.36	49.60	49.77
22.225	52.23	6.43	6.08	5.56	48.95	48.53	48.63	48.74	48.53	48.79
29.632	59.63	6.45	6.15	5.62	44.51	44.72	45.32	43.64	43.96	44.58
37.039	7.04	6.43	6.11	6.04	41.84	42.63	43.62	42.26	43.10	44.11
44.446	14.45	6.52	6.17	6.09	40.48	41.27	42.13	40.30	41.40	42.53
50.000	20.00	6.55	6.25	6.26	38.93	39.99	41.13	39.16	40.43	41.73
62.964	32.96	6.77	6.42	6.46	34.58	35.83	37.01	36.69	37.97	39.05
70.371	40.37	6.81	6.51	6.18	33.01	34.72	36.60	34.40	35.50	36.14
77.779	47.78	7.13	6.81	6.43	32.20	34.07	35.62	32.19	32.41	32.56
85.186	55.19	7.43	7.08	6.83	32.50	33.63	34.68	31.56	31.31	30.96
92.593	62.59	7.43	7.13	6.78	34.01	34.08	34.08	32.70	31.97	30.63
100.000	70.00	7.56	7.24	6.87	36.49	36.43	34.99	33.82	32.88	30.92

mixer VSWR

φ detection

freq. MHz	VSWR, RF port			VSWR, LO port			VSWR, IF port			max. output/DC offset vs. freq.		
	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	Freq. (MHz)	max. DC output mV	DC offset mV
5.001	1.35	1.25	1.15	1.85	2.77	4.14	1.73	1.60	1.44	.003	-241.92	+0.00
7.795	1.36	1.25	1.15	1.80	2.73	3.93	1.74	1.61	1.45	.007	-236.39	+ .02
10.000	1.35	1.25	1.15	1.79	2.68	3.84	1.75	1.61	1.46	.010	-235.94	+ .02
13.382	1.35	1.25	1.15	1.74	2.59	3.67	1.76	1.63	1.48	.040	-235.42	+ .02
18.971	1.33	1.24	1.15	1.82	2.60	3.72	1.79	1.66	1.51	.070	-235.38	+ .02
20.000	1.33	1.23	1.14	1.81	2.58	3.75	1.79	1.67	1.51	.100	-231.29	+ .01
27.353	1.30	1.21	1.12	1.78	2.63	3.66	1.85	1.72	1.57	.300	-226.88	+ .01
32.941	1.27	1.18	1.10	1.79	2.61	3.53	1.92	1.77	1.63	.700	-227.59	+ .01
38.529	1.23	1.15	1.08	1.81	2.55	3.51	1.99	1.84	1.70	1.000	-227.36	+ .01
41.323	1.21	1.13	1.07	1.81	2.55	3.48	2.02	1.88	1.74	5.000	-226.73	+ .01
46.912	1.17	1.10	1.06	1.79	2.56	3.47	2.10	1.97	1.81	14.329	-227.40	+ .03
50.000	1.15	1.08	1.06	1.80	2.56	3.45	2.17	2.02	1.86	23.848	-228.70	+ .07
52.500	1.13	1.07	1.07	1.81	2.56	3.44	2.20	2.07	1.90	33.367	-225.12	+ .09
60.882	1.08	1.06	1.11	1.83	2.56	3.42	2.32	2.18	2.03	42.886	-220.78	+ .12
66.470	1.06	1.08	1.14	1.84	2.55	3.36	2.40	2.28	2.13	50.000	-219.72	+ .08
72.058	1.05	1.10	1.17	1.86	2.53	3.30	2.47	2.35	2.22	61.924	-212.18	+ .46
80.441	1.06	1.13	1.19	1.93	2.57	3.33	2.52	2.42	2.30	70.000	-209.35	+ .60
88.823	1.08	1.15	1.21	2.05	2.71	3.45	2.52	2.43	2.33	80.962	-204.70	+ 1.05
94.411	1.08	1.15	1.20	2.09	2.79	3.60	2.51	2.40	2.32	90.481	-188.36	+ 1.33
100.000	1.07	1.14	1.18	2.16	2.86	3.68	2.49	2.39	2.30	100.000	-170.55	+ 2.08

Measurements at RF & LO Power +7 dBm

Mini-Circuits

P.O. BOX 166, Brooklyn, New York 11235 (718) 934-4500

mixer harmonic intermodulation

(relative to desired IF output)

RF ORDER HARMONIC	RF CAL												
	0	> 88	-	31	51	33	41	27	48	35	60	44	62
	1	> 88	22	-	29	12	34	21	42	37	55	44	60
	2	80	55	51	56	51	57	50	60	53	73	57	73
	3	81	46	39	45	39	45	36	47	50	64	59	71
	4	85	68	63	71	67	69	71	75	66	79	68	81
	5	85	60	55	64	55	60	53	69	62	74	64	74
	6	85	72	70	73	71	70	68	75	78	80	81	81
	7	87	71	64	68	68	65	61	68	65	73	71	77
	8	86	82	83	80	75	78	78	81	81	80	80	80
	9	86	81	74	83	79	> 84	83	76	80	81	79	81
10	85	82	83	83	82	> 84	81	> 84	> 84	80	81	80	
		0	1	2	3	4	5	6	7	8	9	10	
Harmonic LO Order													

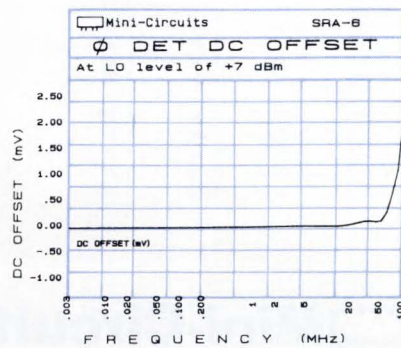
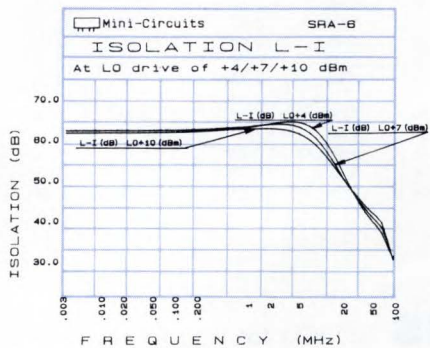
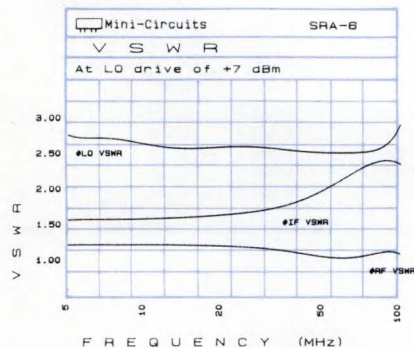
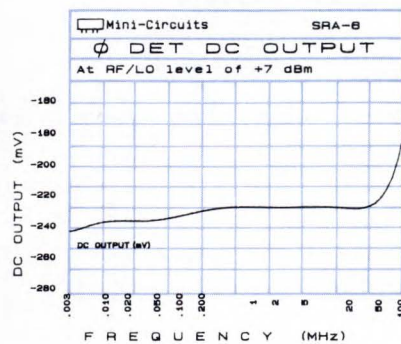
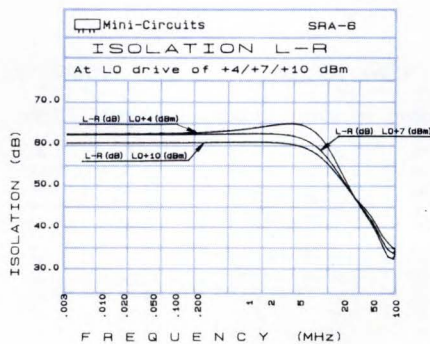
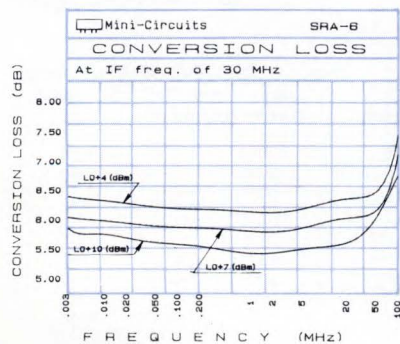
test conditions: RF=10.100 MHz INPUT P_i = -3.94DBM
 LO=40.010 MHz INPUT P_i = +6.82DBM
 IF=29.990 MHz IF=AMPLIT. = -9.26 DBM

RF ORDER HARMONIC	RF CAL												
	0	> 79	-	22	35	22	29	16	36	23	48	31	49
	1	> 79	20	-	28	12	38	19	36	36	51	47	52
	2	> 79	68	63	67	61	65	56	70	58	71	61	71
	3	> 79	65	59	62	59	61	66	66	64	70	63	70
	4	> 79	> 73	> 73	> 73	> 73	> 73	72	71	71	71	71	70
	5	> 79	> 73	> 73	> 73	71	> 73	> 73	> 73	71	70	71	70
	6	> 79	> 73	> 73	> 73	> 73	> 73	> 73	> 73	70	70	69	71
	7	> 79	71	> 73	> 73	> 73	72	> 73	> 73	69	70	70	71
	8	> 79	> 73	> 73	> 73	> 73	> 73	> 73	72	> 73	70	71	71
	9	> 79	72	> 73	> 73	> 73	71	> 73	> 73	> 73	71	69	70
	10	> 79	> 73	> 73	> 73	> 73	> 73	> 73	> 73	> 73	70	70	71
		0	1	2	3	4	5	6	7	8	9	10	
Harmonic LO Order													

test conditions: RF=0.100 MHz INPUT P_i = -13.96DBM
 LO=40.010 MHz INPUT P_i = +6.82DBM
 IF=29.990 MHz IF AMPLIT. = -19.35 DBM ALL HARMONICS ARE

typical performance curves

(production unit)



most widely-used

Frequency Mixers

LEVEL 7 (+7 dBm LO, up to +1 dBm RF)

Models

GRA-8
SRA-8
ZLW-8
ZAD-8



computer-automated performance data
typical production unit / for data of other models consult factory

mixer conversion loss and isolation

RF MHz	LO MHz	Conversion Loss (dB)			Isolation L-R (dB)			Isolation L-I (dB)		
		LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm
.001	3.00	5.43	5.26	4.97	63.49	67.32	68.05	> 64.00	> 67.00	> 70.00
.002	3.00	5.18	4.96	4.76	63.34	67.15	67.96	> 64.00	> 67.00	> 70.00
.005	3.01	4.98	4.92	4.61	63.46	67.23	67.72	> 64.00	> 67.00	> 70.00
.010	3.01	4.96	4.88	4.59	63.99	67.03	67.90	> 64.00	> 67.00	> 70.00
.020	3.02	5.04	4.84	4.64	> 64.00	66.98	68.02	> 64.00	> 67.00	> 70.00
.050	3.05	5.04	4.84	4.61	> 64.00	66.86	68.43	> 64.00	> 67.00	> 70.00
.100	3.10	5.00	4.79	4.59	> 64.00	> 67.00	68.45	> 64.00	> 67.00	> 70.00
.200	3.20	5.06	4.88	4.63	> 64.00	> 67.00	68.61	> 64.00	> 67.00	> 70.00
.500	3.50	5.07	4.86	4.64	> 64.00	66.98	68.77	> 64.00	> 67.00	> 70.00
.700	3.70	5.11	4.83	4.66	> 64.00	> 67.00	68.83	> 64.00	> 67.00	> 70.00
1.000	4.00	5.13	4.88	4.66	> 64.00	66.64	67.78	> 64.00	> 67.00	> 70.00
1.430	4.43	5.12	4.91	4.71	> 64.00	65.85	65.86	> 64.00	> 67.00	> 70.00
2.000	5.00	5.16	4.91	4.72	63.68	64.48	63.99	> 64.00	> 67.00	> 70.00
2.858	5.86	5.15	4.97	4.78	59.08	57.58	56.32	> 64.00	> 67.00	> 70.00
4.287	7.29	5.22	5.16	4.88	54.41	53.00	52.31	> 64.00	> 67.00	> 70.00
5.001	8.00	5.24	5.17	4.89	51.08	50.13	50.21	> 64.00	> 67.00	> 70.00
6.429	9.43	5.36	5.18	4.97	48.83	48.56	48.77	> 64.00	> 67.00	> 70.00
7.143	4.14	5.24	5.21	4.95	45.65	45.59	45.96	> 64.00	> 67.00	> 70.00
8.572	5.57	5.34	5.23	5.11	43.01	43.14	43.64	> 64.00	> 67.00	> 70.00
10.000	7.00	5.54	5.22	5.22						

mixer VSWR

φ detection

freq. MHz	VSWR, RF port			VSWR, LO port			VSWR, IF port			max. output/DC offset vs. freq.		
	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	Freq. (MHz)	max. DC output mV	DC offset mV
.101	1.58	1.41	1.30	1.78	3.30	7.11	1.62	1.47	1.38	.001	-275.22	-.11
.201	1.54	1.37	1.27	1.64	2.70	4.36	1.58	1.44	1.35	.005	-271.22	-.13
.420	1.54	1.38	1.28	1.57	2.54	3.76	1.58	1.43	1.35	.010	-264.26	-.13
.740	1.53	1.37	1.28	1.55	2.46	3.67	1.59	1.44	1.36	.020	-261.87	-.13
1.001	1.54	1.37	1.28	1.56	2.41	3.56	1.58	1.44	1.36	.050	-262.01	-.12
1.698	1.54	1.38	1.29	1.51	2.32	3.35	1.59	1.44	1.37	.100	-259.74	-.12
2.001	1.53	1.38	1.28	1.50	2.29	3.30	1.59	1.44	1.36	.200	-260.96	-.12
2.656	1.54	1.38	1.29	1.46	2.21	3.16	1.60	1.45	1.37	.500	-262.44	-.13
3.294	1.54	1.37	1.28	1.39	2.10	2.93	1.60	1.45	1.37	.700	-264.77	-.13
4.253	1.53	1.37	1.28	1.31	1.98	2.76	1.62	1.47	1.39	1.000	-265.78	-.13
5.001	1.53	1.37	1.29	1.29	1.95	2.67	1.64	1.50	1.42	2.000	-266.07	-.13
5.530	1.52	1.37	1.28	1.29	1.94	2.63	1.64	1.50	1.42	3.334	-259.84	-.13
6.169	1.52	1.36	1.28	1.31	1.96	2.64	1.65	1.52	1.43	4.167	-258.11	-.12
7.001	1.50	1.37	1.28	1.35	2.01	2.74	1.68	1.55	1.46	5.000	-255.49	-.12
7.446	1.50	1.36	1.28	1.38	2.03	2.75	1.69	1.56	1.47	5.834	-250.59	-.12
8.085	1.49	1.36	1.28	1.39	2.02	2.71	1.71	1.58	1.49	6.667	-246.55	-.09
8.404	1.49	1.36	1.27	1.39	1.98	2.67	1.72	1.58	1.51	7.000	-247.09	-.10
9.043	1.48	1.36	1.28	1.35	1.94	2.58	1.74	1.62	1.54	7.500	-246.77	-.13
9.362	1.48	1.36	1.28	1.34	1.92	2.55	1.75	1.61	1.54	8.333	-247.65	-.09
10.000	1.48	1.35	1.27	1.34	1.90	2.51	1.78	1.65	1.57	10.000	-247.81	-.11

Measurements at RF & LO Power +7 dBm

Mini-Circuits

P.O. BOX 166, Brooklyn, New York 11235 (718) 934-4500

mixer harmonic intermodulation

(relative to desired IF output)

RF ORDER HARMONIC	RF CAL											
	0	1	2	3	4	5	6	7	8	9	10	
0	-	-	30	39	35	44	33	51	41	60	50	69
1	-	16	-	26	12	37	20	40	28	43	42	53
2	84	69	66	70	65	63	58	57	49	65	54	75
3	80	45	56	47	45	45	46	45	45	47	47	55
4	>95	71	70	75	70	77	71	76	>85	73	66	79
5	>96	60	56	65	56	64	55	69	54	68	53	62
6	>94	83	>87	81	81	82	78	81	79	86	78	88
7	96	69	80	68	76	69	78	72	71	77	67	79
8	>95	>87	>85	>86	>85	86	>87	>85	>87	86	>86	84
9	>96	84	77	80	74	76	79	80	78	83	81	79
10	>94	>86	87	>87	>85	>88	88	>86	>86	>86	>87	>85
	0	1	2	3	4	5	6	7	8	9	10	

Harmonic LO Order

test conditions: RF, =IN: FREQ. 7.1002 MHz DRIVE -4.04 DBM
 TESTED ON: 16.10.84
 LO, =IN: FREQ. 10.01 MHz DRIVE +7.07 DBM TESTED BY: D.E.
 IF=MEASURED: FREQ. 2.9102 AMP. -9.12 DBM

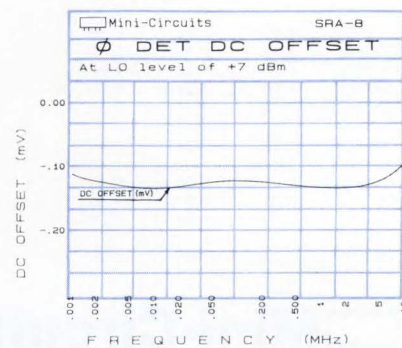
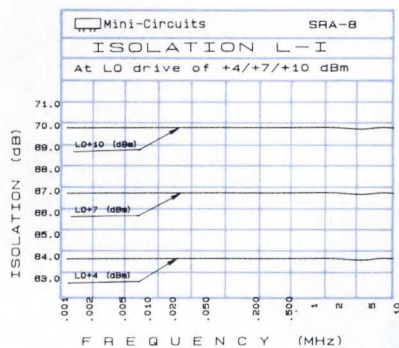
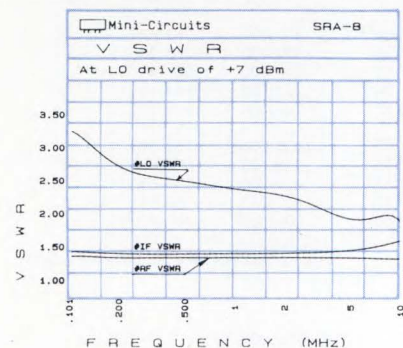
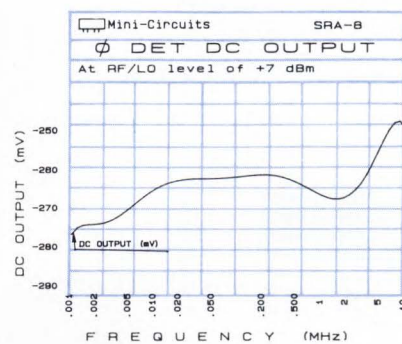
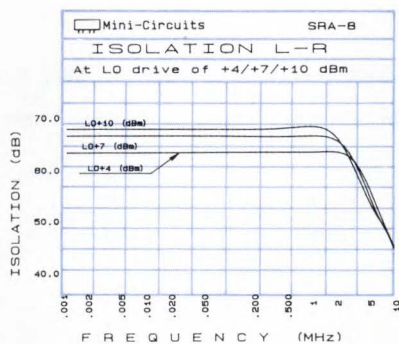
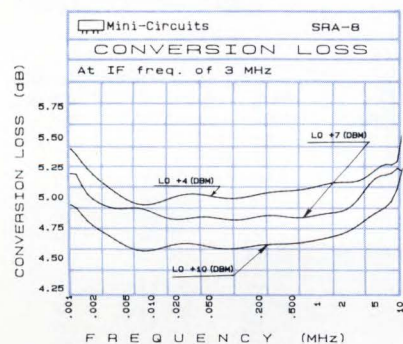
RF ORDER HARMONIC	RF CAL											
	0	1	2	3	4	5	6	7	8	9	10	
0	-	-	20	29	25	33	21	38	27	54	35	64
1	-	16	-	25	12	31	19	34	26	38	35	46
2	>96	73	65	70	66	69	71	65	60	67	61	>76
3	>94	59	61	63	63	65	60	61	56	60	55	68
4	>96	>77	>76	>76	>77	>76	>76	>76	>78	>76	>76	>77
5	>96	>76	>75	77	>75	>75	>76	76	76	>77	74	>77
6	>96	75	>76	>77	76	>77	>77	76	>76	>76	>76	75
7	>95	>76	>76	>76	>76	>77	>75	>77	>77	>76	>77	>77
8	>96	>76	>77	>77	>76	>76	>76	>76	>77	>76	>77	>76
9	>95	>77	>76	>76	>78	76	>77	>77	>77	>75	>77	>75
10	>94	77	>76	>76	>77	>76	>76	>77	>76	>77	>75	>77
	0	1	2	3	4	5	6	7	8	9	10	

Harmonic LO Order

test conditions: RF, =IN: FREQ. 7.1002 MHz DRIVE -13.94 DBM
 TESTED ON: 16.10.84
 LO, =IN: FREQ. 10.01 MHz DRIVE +7.07 DBM TESTED BY: D.E.
 IF=MEASURED: FREQ. 2.9102 AMP. -18.95 DBM

typical performance curves

(production unit)



most widely-used

Frequency Mixers

LEVEL 7 (+7 dBm LO, up to +1 dBm RF)

Models

SRA-1-1

ZLW-1-1

ZAD-1-1



computer-automated performance data

typical production unit / for data of other models consult factory

mixer conversion loss and isolation

RF MHz	LO MHz	Conversion Loss (dB)			Isolation L-R (dB)			Isolation L-I (dB)		
		LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm
.100	30.10	6.29	5.97	5.79	> 64.00	> 67.00	> 70.00	> 64.00	> 67.00	> 70.00
.500	30.50	5.39	5.10	4.97	> 64.00	> 67.00	> 70.00	> 64.00	> 67.00	> 70.00
1.000	31.00	5.26	5.03	4.88	> 64.00	> 67.00	> 70.00	> 64.00	60.45	58.45
2.000	32.00	5.17	4.95	4.83	> 64.00	> 67.00	> 70.00	> 64.00	60.33	58.40
5.000	35.00	5.09	4.94	4.79	> 64.00	> 67.00	> 70.00	> 64.00	60.77	58.85
10.000	40.00	5.11	4.92	4.82	> 64.00	> 67.00	> 70.00	> 64.00	61.39	59.31
20.000	50.00	5.23	5.01	4.91	> 64.00	> 67.00	> 70.00	> 64.00	61.65	59.31
50.000	80.00	5.11	4.95	4.85	> 64.00	> 67.00	60.40	> 64.00	61.63	57.18
69.828	99.83	5.07	4.92	4.82	> 64.00	57.89	55.46	> 64.00	55.93	53.10
100.000	70.00	4.98	4.82	4.77	53.52	51.38	50.35	51.19	49.30	48.15
173.070	143.07	5.09	4.99	4.92	42.69	42.54	43.78	40.65	40.81	42.06
200.000	170.00	5.19	5.08	4.99	43.25	43.50	43.78	40.60	41.01	41.28
224.690	194.69	5.33	5.23	5.09	40.97	41.57	42.12	38.49	39.41	40.10
259.110	229.11	5.35	5.21	5.12	38.29	38.74	39.32	36.72	36.85	37.59
293.520	263.52	5.41	5.32	5.28	36.69	37.88	39.26	35.47	36.40	37.52
345.140	315.14	5.80	5.71	5.62	35.04	36.54	37.94	32.97	33.55	34.49
396.760	366.76	6.04	5.68	5.37	36.38	37.59	38.39	34.55	34.68	33.66
431.180	401.18	6.70	5.98	5.36	37.85	37.76	38.44	36.93	36.68	35.35
465.590	435.59	7.52	7.01	6.30	37.33	37.18	37.12	35.95	36.08	35.13
500.000	470.00	8.25	7.80	7.14	37.02	38.33	40.41	33.62	34.17	32.40

mixer VSWR

φ detection

freq. MHz	VSWR, RF port			VSWR, LO port			VSWR, IF port			max. output/DC offset vs. freq.		
	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	Freq. (MHz)	max. DC output mV	DC offset mV
5.001	1.38	1.27	1.20	1.50	2.30	3.45	2.13	1.92	1.78	.100	-252.07	+ .02
10.000	1.38	1.27	1.20	1.42	2.24	3.20	2.12	1.91	1.77	.200	-255.06	+ .03
20.000	1.37	1.27	1.20	1.51	2.26	3.25	2.12	1.90	1.76	.500	-256.56	+ .02
34.118	1.35	1.25	1.18	1.47	2.20	3.09	2.13	1.91	1.77	1.000	-257.44	+ .02
50.000	1.33	1.23	1.16	1.43	2.16	3.02	2.15	1.92	1.78	2.000	-256.78	+ .02
77.795	1.28	1.18	1.12	1.41	2.11	2.89	2.16	1.93	1.80	5.000	-258.91	+ .02
100.000	1.25	1.15	1.09	1.40	2.08	2.88	2.21	1.96	1.85	10.000	-257.73	+ .02
121.470	1.21	1.12	1.07	1.47	2.09	2.94	2.24	2.00	1.87	20.000	-259.14	+ .03
150.590	1.16	1.09	1.07	1.50	2.12	2.86	2.34	2.05	1.93	50.000	-256.04	+ .02
179.710	1.13	1.10	1.10	1.51	2.18	2.87	2.42	2.13	1.99	73.912	-260.65	+ .03
200.000	1.12	1.11	1.14	1.53	2.22	2.96	2.44	2.19	2.04	100.000	-261.64	+ .05
223.390	1.12	1.15	1.19	1.58	2.23	2.93	2.51	2.24	2.08	159.130	-256.39	+ .09
267.060	1.16	1.22	1.27	1.69	2.38	3.05	2.60	2.32	2.17	200.000	-257.48	+ .15
296.180	1.20	1.27	1.33	1.71	2.43	3.15	2.66	2.37	2.24	223.040	-261.16	+ .20
325.300	1.24	1.31	1.38	1.80	2.44	3.20	2.68	2.41	2.25	265.650	-248.60	+ .26
354.420	1.27	1.34	1.41	1.93	2.56	3.26	2.66	2.37	2.25	300.000	-236.58	+ .14
383.530	1.29	1.36	1.41	2.09	2.75	3.42	2.65	2.37	2.23	372.170	-208.88	- .07
412.650	1.29	1.35	1.40	2.17	2.85	3.56	2.69	2.37	2.24	400.000	-197.61	- .18
441.770	1.26	1.31	1.36	2.22	2.95	3.69	2.65	2.34	2.19	457.380	-180.61	- .37
470.890	1.19	1.23	1.28	2.29	3.00	3.82	2.63	2.31	2.16	500.000	-182.97	+ .07
500.000	1.13	1.16	1.21	2.32	3.10	3.77	2.70	2.32	2.18	Measurements at RF & LO Power +7 dBm		

Mini-Circuits

P.O. BOX 166, Brooklyn, New York 11235

(718) 934-4500

mixer harmonic intermodulation

(relative to desired IF output)

RF ORDER HARMONIC	RF CAL	0	1	2	3	4	5	6	7	8	9	10
0	>89	-	41	48	40	59	33	49	33	52	41	72
1	>89	20	-	31	11	39	18	39	27	43	43	52
2	76	56	69	61	64	63	65	64	52	56	48	64
3	85	51	44	50	45	58	45	52	41	55	45	53
4	85	73	64	74	66	72	66	76	67	72	66	67
5	85	>83	59	67	63	69	57	66	54	66	53	73
6	85	80	82	79	77	>83	74	>84	75	>84	74	>83
7	84	80	76	82	69	79	72	77	74	76	70	74
8	86	80	79	80	80	>83	>83	>83	83	>84	>84	>84
9	86	79	80	80	80	80	81	>83	77	82	>83	81
10	85	80	80	80	80	80	81	>83	>83	>83	>83	>83
		0	1	2	3	4	5	6	7	8	9	10

Harmonic LO Order

test conditions: RF = 185.100 MHz INPUT P. -3.91 DBM
 LO = 155.010 MHz INPUT P. +6.83 DBM
 IF = 30.090 MHz IF = AMPLIT. -9.36 DBM

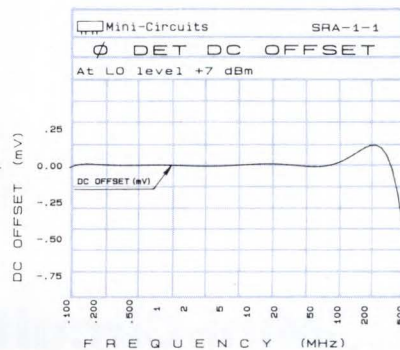
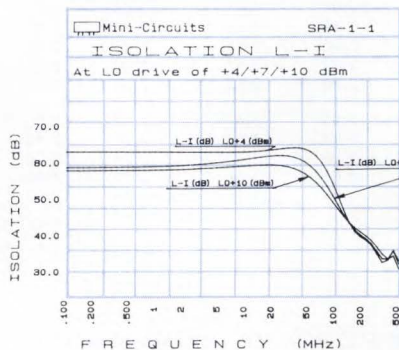
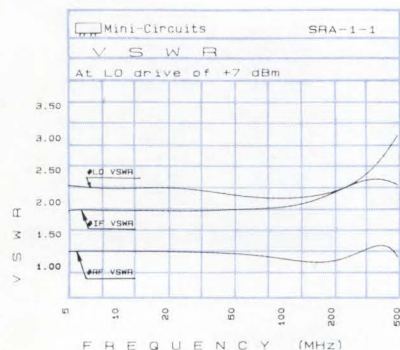
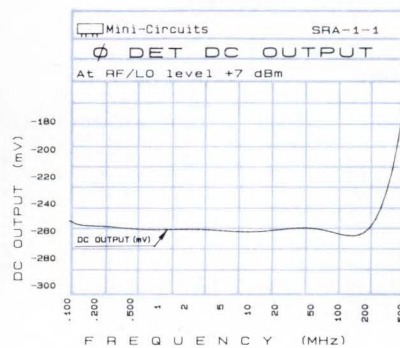
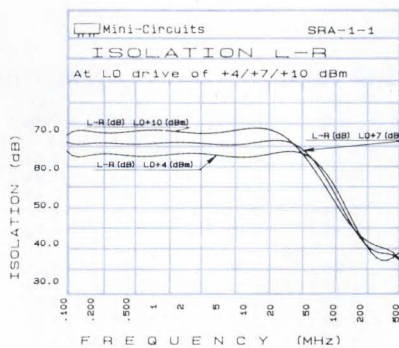
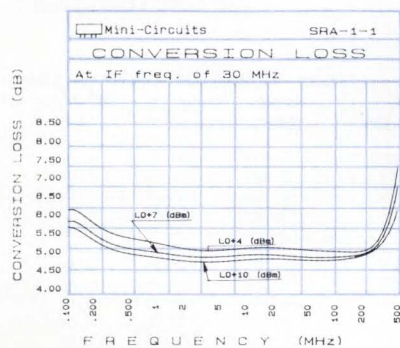
RF ORDER HARMONIC	RF CAL	0	1	2	3	4	5	6	7	8	9	10
0	>80	-	34	37	29	47	21	34	20	43	26	60
1	>80	20	-	32	12	36	17	40	26	40	42	48
2	>80	62	61	64	59	67	60	63	54	58	52	68
3	>80	72	59	67	63	67	57	>73	57	66	58	>73
4	>80	>73	>73	>73	>73	>74	>74	>74	>73	>73	>73	>73
5	>80	>73	>73	>73	>73	>73	>74	>74	>74	>73	>73	>73
6	>80	69	>73	>73	>73	>73	>73	>74	>74	>74	>73	>73
7	>80	70	70	>73	>73	>73	>73	>73	>74	>74	>74	>73
8	>80	69	70	69	68	>73	>73	>73	>73	>74	>74	>74
9	>80	69	69	70	71	70	>73	>73	>73	>73	>73	>74
10	>79	70	70	70	70	70	70	>73	>73	>73	>73	>73
		0	1	2	3	4	5	6	7	8	9	10

HARMONIC LO ORDER

test conditions: RF 185.100 MHz INPUT P. -13.96 DBM
 LO 155.010 MHz INPUT P. +6.83 DBM
 IF = 30.090 MHz IF = AMPLIT. -19.44 DBM

typical performance curves

(production unit)



most widely-used

Frequency Mixers

LEVEL 7 (+7 dBm LO, up to +1 dBm RF)

Models

SRA-1W

ZLW-1W

ZAD-1W



computer-automated performance data

typical production unit / for data of other models consult factory

mixer conversion loss and isolation

RF MHz	LO MHz	Conversion Loss (dB)			Isolation L-R (dB)			Isolation L-I (dB)		
		LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm
1.000	31.00	6.40	6.42	6.47	> 64.00	> 67.00	> 70.00	> 64.00	> 67.00	64.91
2.000	32.00	6.15	5.97	6.07	> 64.00	> 67.00	> 70.00	> 64.00	> 67.00	64.71
5.000	35.00	5.80	5.50	5.73	> 64.00	> 67.00	> 70.00	> 64.00	> 67.00	64.82
10.000	40.00	5.92	5.66	5.47	> 64.00	> 67.00	> 70.00	> 64.00	> 67.00	65.02
20.000	50.00	5.93	5.60	5.41	> 64.00	> 67.00	> 70.00	> 64.00	> 67.00	64.65
50.000	80.00	5.85	5.60	5.50	> 64.00	> 67.00	> 70.00	> 64.00	62.28	61.08
100.000	70.00	5.75	5.47	5.47	> 64.00	> 67.00	59.87	54.37	55.09	54.33
130.140	100.14	5.74	5.52	5.42	> 64.00	57.96	55.48	51.69	51.55	51.11
200.000	170.00	5.81	5.62	5.55	51.92	50.48	49.20	46.26	45.84	44.92
285.110	255.11	5.64	5.47	5.44	46.41	45.61	44.78	41.42	40.64	40.18
362.590	332.59	5.90	5.71	5.53	43.45	42.62	42.43	38.16	37.34	37.26
414.250	384.25	6.10	5.97	5.63	40.29	40.09	40.38	35.59	36.21	36.95
500.000	470.00	6.39	6.14	5.93	40.14	39.49	39.46	33.46	33.17	33.44
543.390	513.39	6.45	6.24	5.97	38.53	37.59	37.08	32.09	31.35	31.13
595.040	565.04	6.61	6.21	6.28	37.16	37.44	37.78	32.18	31.39	31.01
646.700	616.70	6.61	6.16	5.91	35.85	36.31	37.13	33.13	33.58	33.33
672.530	642.53	6.88	6.27	5.93	36.55	36.63	37.42	30.97	31.60	31.99
698.360	668.36	7.13	6.43	5.95	36.25	36.64	37.41	29.19	29.86	30.40
724.180	694.18	7.46	6.68	6.13	36.48	36.68	37.16	28.44	28.78	29.14
750.000	720.00	7.84	6.98	6.25	35.61	35.77	36.24	27.28	27.45	27.86

mixer VSWR

φ detection

freq. MHz	VSWR, RF port			VSWR, LO port			VSWR, IF port			max. output/DC offset vs. freq.		
	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	Freq. (MHz)	max. DC output mV	DC offset mV
5.001	1.15	1.20	1.23	2.15	3.31	4.93	1.64	1.46	1.35	1.000	-225.12	-06
10.000	1.07	1.12	1.16	2.07	3.09	4.57	1.64	1.46	1.35	2.000	-228.82	-06
20.000	1.05	1.10	1.15	2.12	3.15	4.56	1.64	1.46	1.36	5.000	-229.29	-06
50.000	1.08	1.12	1.17	2.04	2.99	4.21	1.65	1.47	1.37	10.000	-231.45	-05
78.484	1.10	1.14	1.19	2.00	2.99	4.06	1.67	1.50	1.40	20.000	-226.19	-04
100.000	1.11	1.16	1.21	2.00	2.84	3.86	1.68	1.51	1.42	49.322	-222.81	-04
155.970	1.15	1.20	1.25	1.99	2.88	3.83	1.77	1.60	1.51	73.483	-223.49	-05
200.000	1.18	1.23	1.28	1.96	2.75	3.59	1.86	1.68	1.59	100.000	-228.62	-05
259.280	1.24	1.30	1.35	1.96	2.74	3.56	1.99	1.81	1.71	145.970	-229.46	-04
310.940	1.29	1.35	1.41	2.00	2.74	3.58	2.12	1.93	1.81	200.000	-226.10	+0.00
362.590	1.34	1.40	1.46	2.08	2.78	3.61	2.26	2.05	1.94	266.770	-229.57	+0.00
414.250	1.39	1.45	1.50	2.07	2.78	3.56	2.35	2.13	2.01	387.580	-193.60	+08
465.900	1.43	1.48	1.53	2.10	2.80	3.48	2.43	2.22	2.09	460.060	-199.61	-23
517.560	1.45	1.50	1.54	2.15	2.82	3.52	2.45	2.24	2.11	500.000	-207.29	-12
569.220	1.47	1.49	1.53	2.18	2.85	3.52	2.45	2.23	2.11	556.700	-187.14	+32
620.870	1.49	1.51	1.54	2.30	2.93	3.47	2.38	2.20	2.09	605.030	-160.57	+22
672.530	1.55	1.58	1.60	2.39	2.94	3.57	2.27	2.10	2.00	677.510	-144.43	+16
698.360	1.62	1.64	1.68	2.41	3.03	3.52	2.24	2.05	1.97	701.670	-137.65	-18
724.180	1.69	1.72	1.75	2.43	3.01	3.55	2.16	1.99	1.91	725.830	-124.38	-31
750.000	1.80	1.83	1.86	2.45	3.01	3.56	2.11	1.93	1.84	750.000	-115.97	-53

Measurements at RF & LO Power +7 dBm

Mini-Circuits

P.O. BOX 166, Brooklyn, New York 11235

(718) 934-4500

mixer harmonic intermodulation

(relative to desired IF output)

RF ORDER HARMONIC	RF CAL									
	0	1	2	3	4	5	6	7	8	9
0	>80	-	14	23	11	32	11	25	26	46
1	>80	18	-	36	10	34	34	35	47	51
2	>80	>74	53	>72	55	66	51	71	49	59
3	>80	70	58	68	57	67	53	70	>73	67
4	>80	68	>74	>74	>72	>72	>72	>72	>73	67
5	>80	68	68	>74	>74	>72	>72	>72	>72	73
6	>80	69	68	69	>74	>74	>72	>72	>72	>74
7	>80	69	68	68	68	>74	>74	>72	>72	>72
8	>80	69	69	68	68	67	>74	>74	>72	>72
9	>80	69	70	69	69	68	68	>74	>74	>72
10	>80	69	68	69	69	67	68	68	>74	>72
	0	1	2	3	4	5	6	7	8	9

Harmonic LO Order

test conditions: RF=500.100 MHz INPUT P.₁ = -14.06 DBM
 LO=470.010 MHz INPUT P.₂ = +7.15 DBM
 IF= 30.090 MHz IF AMPLIT. = -20.66 DBM

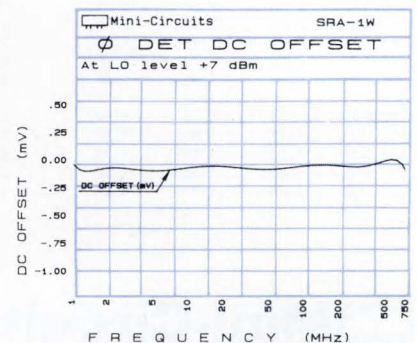
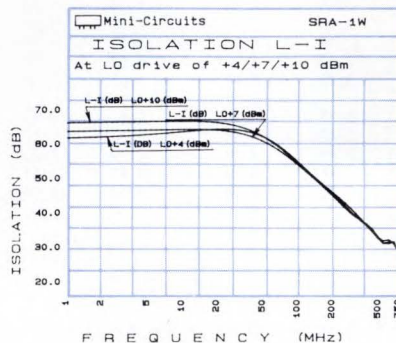
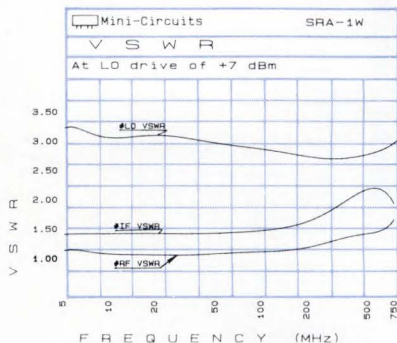
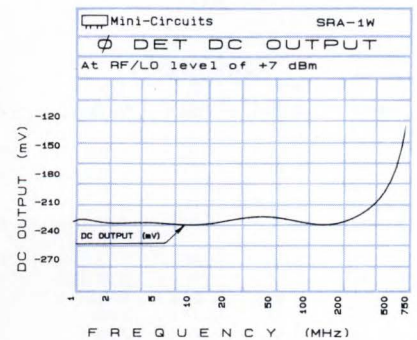
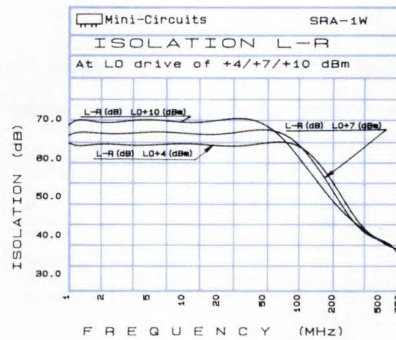
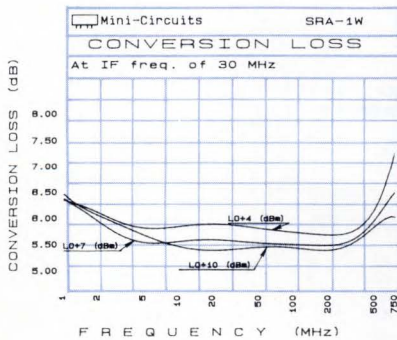
RF ORDER HARMONIC	RF CAL									
	0	1	2	3	4	5	6	7	8	9
0	>90	-	22	34	23	48	22	37	38	59
1	>90	18	-	37	11	36	38	40	59	54
2	76	64	44	65	47	58	42	77	42	50
3	85	54	46	54	41	57	37	59	64	54
4	84	78	76	69	61	75	59	69	61	76
5	83	77	71	83	58	64	54	66	51	64
6	84	77	79	76	>84	83	73	79	69	77
7	85	79	76	77	78	>84	79	>82	73	80
8	86	79	79	79	78	78	>84	>84	>82	>81
9	85	77	79	78	79	79	78	84	>84	>82
10	85	79	79	79	80	78	78	77	>84	84
	0	1	2	3	4	5	6	7	8	9

Harmonic LO Order

test conditions: RF=500.100 MHz INPUT P.₁ = -3.98 DBM
 LO=470.010 MHz INPUT P.₂ = +7.15 DBM
 IF=30.090 MHz IF AMPLIT. = -10.65 DBM

typical performance curves

(production unit)



most widely-used

Frequency Mixers

LEVEL 7 (+7 dBm LO, up to +1 dBm RF)

Models

SRA-2
ZAD-2



computer-automated performance data
typical production unit / for data of other models consult factory

mixer conversion loss and isolation

RF MHz	LO MHz	Conversion Loss (dB)			Isolation L-R (dB)			Isolation L-I (dB)		
		LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm
1.000	31.00	6.07	5.81	5.46	62.60	62.40	> 66.00	> 64.00	66.60	> 70.00
10.000	40.00	6.08	5.74	5.59	> 64.00	> 67.00	> 70.00	> 64.00	> 67.00	> 70.00
20.000	50.00	6.30	5.87	5.69	> 64.00	63.37	61.98	> 64.00	> 67.00	65.75
50.000	80.00	6.12	5.77	5.63	55.60	55.36	54.47	59.32	58.05	57.23
100.000	70.00	6.19	5.79	5.61	49.88	49.04	48.78	53.06	52.36	51.54
160.320	130.32	6.26	5.85	5.67	45.01	45.18	45.58	49.33	48.76	47.95
200.000	170.00	6.37	5.92	5.76	42.87	43.67	44.12	47.83	47.23	46.11
284.570	254.57	6.33	5.95	5.78	39.78	41.08	41.57	45.98	44.56	43.24
346.690	316.69	6.46	6.00	5.80	37.76	39.04	39.72	46.26	43.59	42.36
408.820	378.82	6.63	6.15	6.03	36.41	36.94	37.09	45.83	43.85	42.15
500.000	470.00	6.65	6.25	6.02	34.76	35.65	36.13	42.46	41.57	41.15
533.070	503.07	6.60	6.19	5.99	33.76	34.41	34.81	41.86	42.87	40.89
595.200	565.20	6.36	5.96	5.83	31.57	33.15	32.76	38.80	37.76	37.80
688.390	658.39	5.98	5.57	5.36	30.43	31.77	33.15	38.78	38.59	39.85
750.510	720.51	6.09	5.59	5.38	29.69	30.90	32.19	40.24	40.39	41.51
800.000	770.00	6.10	5.60	5.40	29.15	30.50	31.72	41.59	41.73	42.48
843.700	813.70	6.02	5.64	5.42	28.90	30.24	31.53	41.01	41.84	41.85
905.830	875.83	5.98	5.62	5.46	28.01	28.94	30.05	37.68	47.26	38.04
967.950	937.95	6.15	5.81	5.66	27.16	28.12	28.44	36.14	35.84	35.75
1000.000	970.00	6.36	6.10	5.89	26.28	27.73	27.35	33.59	32.72	33.16

mixer VSWR

freq. MHz	VSWR, RF port			VSWR, LO port			VSWR, IF port		
	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm
5.001	1.94	1.73	1.58	2.14	3.13	4.78	1.32	1.39	1.45
10.000	1.94	1.73	1.59	2.01	2.99	4.46	1.23	1.31	1.37
20.000	1.93	1.73	1.59	2.14	3.08	4.50	1.19	1.28	1.35
50.000	1.95	1.74	1.61	2.02	2.94	4.34	1.19	1.29	1.35
100.000	1.99	1.80	1.67	1.98	2.86	3.95	1.23	1.31	1.38
137.670	2.05	1.86	1.73	1.96	2.78	3.79	1.26	1.34	1.40
200.000	2.17	1.97	1.88	1.93	2.72	3.68	1.31	1.38	1.44
237.170	2.25	2.06	1.95	1.91	2.74	3.68	1.33	1.40	1.46
303.500	2.35	2.17	2.05	1.94	2.74	3.60	1.34	1.41	1.47
369.840	2.42	2.23	2.12	2.04	2.85	3.76	1.31	1.37	1.43
436.170	2.40	2.21	2.11	2.10	2.86	3.68	1.24	1.30	1.35
500.000	2.31	2.11	2.01	2.14	2.92	3.68	1.15	1.20	1.24
568.840	2.17	1.98	1.86	2.25	2.94	3.76	1.12	1.17	1.21
635.170	2.01	1.78	1.66	2.34	3.02	3.79	1.32	1.35	1.39
701.510	1.90	1.66	1.49	2.47	3.13	3.97	1.65	1.68	1.73
767.840	1.81	1.56	1.39	2.61	3.33	4.10	2.10	2.12	2.17
800.000	1.77	1.55	1.37	2.68	3.40	4.14	2.37	2.37	2.44
867.340	1.76	1.57	1.46	2.74	3.45	4.19	2.99	3.00	3.00
933.680	1.66	1.56	1.52	2.75	3.47	4.14	3.62	3.57	3.55
1000.000	1.43	1.41	1.41	2.72	3.30	4.04	4.13	4.05	3.96

Mini-Circuits

P.O. BOX 166, Brooklyn, New York 11235 (718) 934-4500

mixer harmonic intermodulation

(relative to desired IF output)

RF ORDER HARMONIC	RF CAL	0	1	2	3	4	5	6	7	8	9	10
0	>90	-	36	27	43	47	37	49	32	60	48	64
1	>90	17	-	37	16	37	33	42	35	50	57	59
2	77	52	60	51	58	54	69	75	56	54	43	75
3	>90	46	39	51	38	47	39	46	48	51	47	54
4	>90	78	78	62	69	58	77	60	71	76	70	67
5	>90	77	77	68	52	60	47	59	46	61	68	63
6	>90	78	78	77	82	75	77	73	>82	73	77	79
7	>90	78	79	77	77	75	71	69	65	65	60	66
8	>90	80	80	79	78	79	>83	81	>82	79	>82	73
9	>90	79	78	78	78	79	79	>83	77	74	67	72
10	>90	79	79	80	79	79	79	78	>83	84	>82	>82

Harmonic LO Order

test conditions: RF=500.100 MHz INPUT P.₁ = -3.95DBM
 LO=470.010 MHz INPUT P.₂ = +6.86DBM
 IF=30.090MHz IF AMPLIT. = -10.56 DBM

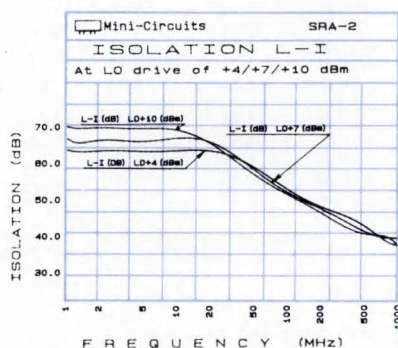
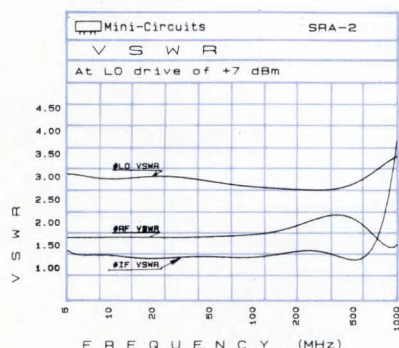
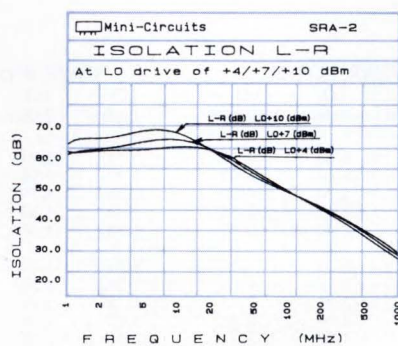
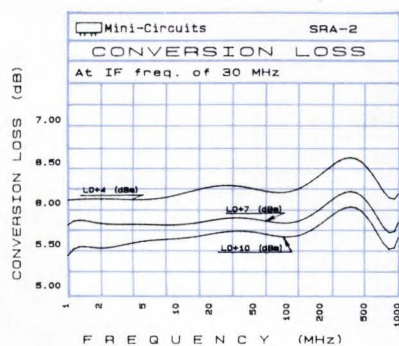
RF ORDER HARMONIC	RF CAL	0	1	2	3	4	5	6	7	8	9	10
0	>80	-	27	17	35	35	24	33	18	45	31	51
1	>80	18	-	34	18	31	29	34	28	42	44	43
2	>80	57	61	52	61	53	66	68	64	56	45	67
3	>80	67	55	65	52	65	52	67	68	64	57	69
4	>80	68	>74	73	>72	>72	>72	>72	>74	>73	68	68
5	>80	69	69	>74	>74	>72	>72	>72	>72	>74	>74	68
6	>80	68	69	68	>74	>74	>72	>72	>72	>72	>74	73
7	>80	69	68	68	69	73	>74	>72	>72	>72	>72	>74
8	>80	68	69	69	69	68	>74	>74	>72	>72	>72	>72
9	>80	69	68	69	68	69	67	>74	>74	>72	>72	>72
10	>80	69	68	70	69	68	69	68	>74	>74	>72	>72

Harmonic LO Order

test conditions: RF=500.100 MHz INPUT P.₁ = -13.94DBM
 LO=470.010 MHz INPUT P.₂ = +6.86DBM
 IF=30.090 MHz IF AMPLIT. = -20.53 DBM

typical performance curves

(production unit)



most widely-used

Frequency Mixers **Models**

LEVEL 7 (+7 dBm LO, up to +1 dBm RF)

SRA-11
ZLW-11
ZAD-11



computer-automated performance data

typical production unit / for data of other models consult factory

mixer conversion loss and isolation

RF MHz	LO MHz	Conversion Loss (dB)			Isolation L-R (dB)			Isolation L-I (dB)		
		LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm
5.000	35.00	5.92	5.85	5.80	46.33	46.19	48.51	> 64.00	> 67.00	> 70.00
10.000	40.00	6.02	5.88	5.81	46.80	46.23	48.89	> 64.00	> 67.00	> 70.00
20.000	50.00	6.35	6.11	5.99	46.84	46.26	48.68	> 64.00	> 67.00	> 70.00
50.000	80.00	6.61	6.37	6.24	46.25	45.89	47.69	> 64.00	> 67.00	69.02
100.000	70.00	6.49	6.25	6.14	44.81	44.70	45.68	> 64.00	64.66	64.72
200.000	170.00	6.94	6.62	6.39	41.62	41.17	41.39	57.90	55.90	54.53
311.920	281.92	7.16	6.71	6.44	39.17	38.72	38.07	50.53	50.11	51.19
465.390	435.39	7.66	7.06	6.64	36.28	37.94	35.08	44.95	46.15	47.44
618.850	588.85	7.95	7.40	7.00	33.62	38.38	32.75	43.83	45.38	47.50
772.310	742.31	7.79	7.53	7.35	33.55	38.07	32.37	44.19	45.67	46.26
849.040	819.04	7.49	7.22	7.09	32.38	37.13	31.82	42.69	43.78	44.40
1000.000	970.00	7.28	7.05	6.96	30.89	36.28	29.71	37.21	38.27	39.01
1156.000	1126.00	7.04	6.76	6.66	31.61	35.18	29.94	44.42	43.23	41.99
1386.200	1356.20	8.05	7.53	7.24	38.48	41.65	36.24	41.70	38.52	36.21
1462.900	1432.90	8.10	7.62	7.34	41.17	41.43	33.31	43.90	41.57	39.61
1500.000	1470.00	7.94	7.48	7.24	39.84	41.94	35.06	44.76	42.71	40.60
1616.400	1586.40	7.34	6.96	6.78	38.73	43.41	40.48	46.03	43.97	43.05
1800.000	1770.00	7.07	6.79	6.60	40.00	41.03	41.30	40.95	38.23	35.95
1923.300	1893.30	6.90	6.64	6.51	39.95	38.49	40.75	32.70	30.27	28.57
2000.000	1970.00	6.99	6.69	6.52	39.23	39.35	39.94	29.79	27.98	26.39

mixer VSWR

freq. MHz	VSWR, RF port			VSWR, LO port			VSWR, IF port		
	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm
5.001	3.06	3.19	3.19	2.29	3.03	4.59	3.11	3.21	3.24
10.000	2.54	2.54	2.51	1.90	2.69	4.03	1.90	2.08	2.20
50.000	2.48	2.45	2.43	1.81	2.70	4.02	1.55	1.79	1.93
100.000	2.64	2.62	2.58	1.81	2.61	3.85	1.48	1.68	1.81
200.000	3.00	2.96	2.92	1.83	2.46	3.45	1.38	1.55	1.67
300.560	3.25	3.21	3.17	1.83	2.31	3.19	1.34	1.49	1.59
374.450	3.42	3.31	3.28	1.86	2.27	3.05	1.38	1.52	1.62
500.000	3.40	3.42	3.37	1.76	2.13	2.75	1.53	1.67	1.76
670.000	3.25	3.19	3.18	1.70	2.08	2.48	1.90	2.08	2.17
817.780	3.00	2.96	2.93	1.81	1.93	2.27	2.30	2.56	2.66
1000.000	2.50	2.41	2.35	1.83	1.73	1.98	3.00	3.20	3.35
1100.000	2.24	2.10	2.01	1.79	1.58	1.78	3.90	4.07	4.20
1200.000	2.05	1.86	1.73	1.63	1.45	1.64	4.72	4.75	4.91
1408.900	2.28	2.12	2.02	1.41	1.17	1.47	4.12	4.12	4.14
1500.000	2.44	2.27	2.12	1.25	1.17	1.52	9.74	9.63	9.79
1630.600	2.32	2.19	2.06	1.15	1.32	1.68	13.39	13.09	13.29
1704.400	2.22	2.08	2.00	1.11	1.39	1.83	12.71	12.26	12.44
1852.200	1.97	1.87	1.81	1.18	1.59	1.99	10.96	11.10	10.89
1926.100	1.85	1.79	1.72	1.26	1.70	2.16	10.31	9.90	9.79
2000.000	1.77	1.67	1.62	1.33	1.74	2.14	9.23	8.72	8.72

Mini-Circuits

P.O. BOX 166, Brooklyn, New York 11235 (718) 934-4500

mixer harmonic intermodulation

(relative to desired IF output)

RF ORDER HARMONIC	RF CAL	0	1	2	3	4	5	6	7	8	9	10
	0	-	-	14	34	23	48	33	57	44	60	62
	1	-	16	-	29	23	36	36	37	52	58	49
	2	94	61	54	61	44	66	49	69	48	63	55
	3	>94	68	44	66	38	53	51	66	53	51	62
	4	93	>84	72	75	65	82	57	75	60	80	61
	5	>95	82	80	82	65	>84	56	70	70	75	65
	6	>90	>77	>83	>84	77	>83	74	>84	66	>83	68
	7	89	>77	>77	>84	>84	>84	80	>84	69	79	>85
	8	>89	>78	>78	>77	>85	>86	>83	>84	>84	>84	75
	9	>89	78	>79	>78	>77	>84	>83	>84	>84	>84	81
	10	89	>79	>78	>76	>79	>77	>83	>83	>83	>82	>84

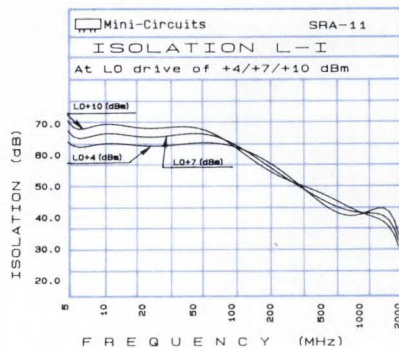
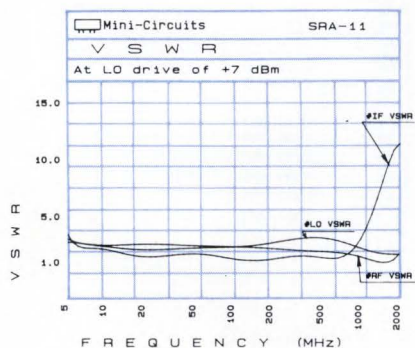
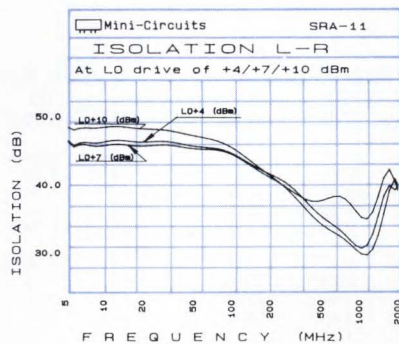
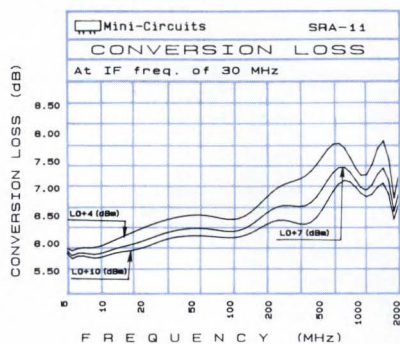
RF ORDER HARMONIC	RF CAL	0	1	2	3	4	5	6	7	8	9	10
	0	-	-	4	24	13	37	21	38	33	40	49
	1	-	16	-	29	23	36	34	33	48	52	40
	2	>94	66	66	68	52	70	53	>73	53	65	58
	3	>94	>73	64	>73	57	71	69	>73	67	67	74
	4	>95	>74	>73	>73	74	>75	>74	>73	>73	>75	>74
	5	>95	>74	>73	>74	>73	>74	>74	>74	>73	>73	>75
	6	>89	>69	>75	>74	>74	>73	>74	>75	>74	>74	>74
	7	>89	>66	>67	>74	>75	>75	>74	>75	>74	>74	>73
	8	>90	>67	>67	>68	>74	>74	>72	>73	>74	>74	>73
	9	>89	>67	>70	67	>68	>74	>74	>73	>73	>74	>74
	10	>88	>68	68	>68	>67	>68	>73	>74	>74	>73	>74

test conditions: RF.=IN: FREQ. 1000.1 MHZ DRIVE -4 DBM TESTED ON :16.10.84
 LO.=IN: FREQ. 970.01 MHZ DRIVE +6.97 DBM TESTED BY :D.E.
 IF=MEASURED: FREQ. 30.09 AMP. -11.21 DBM

test conditions: RF.=IN: FREQ. 1000.1 MHZ DRIVE -14.01 DBM
 TESTED ON :15.10.84
 LO.=IN: FREQ. 970.01 MHZ DRIVE +6.94 DBM TESTED BY :D.E.
 IF=MEASURED: FREQ. 30.09 AMP. -21.27 DBM

typical performance curves

(production unit)



most widely-used

Frequency Mixers

LEVEL 7 (+7 dBm LO, up to +1 dBm RF)

Models

SRA-2000
ZFM-2000



computer-automated performance data
typical production unit / for data of other models consult factory

mixer conversion loss and isolation

RF MHz	LO MHz	Conversion Loss (dB)			Isolation L-R (dB)			Isolation L-I (dB)		
		LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm
100.000	70.00	9.75	9.45	9.21	55.86	56.94	57.94	52.95	55.05	55.35
163.330	133.33	8.22	7.92	7.75	50.50	51.21	52.34	49.70	49.66	50.37
200.000	170.00	8.09	7.75	7.56	49.54	50.54	51.46	48.64	48.68	49.39
290.000	260.00	8.16	7.71	7.42	44.50	44.91	45.60	40.82	39.11	37.96
416.670	386.67	9.02	8.09	7.69	43.16	42.91	43.02	36.51	35.05	34.05
500.000	470.00	8.58	7.87	7.53	39.99	39.28	39.16	31.52	30.43	29.68
606.660	576.66	8.64	7.96	7.64	38.76	37.70	37.00	31.01	29.62	28.64
733.330	703.33	8.53	8.16	8.00	35.70	35.16	34.63	29.03	27.84	26.89
800.000	770.00	8.27	7.98	7.88	33.74	33.65	33.57	27.31	26.31	25.52
923.330	893.33	8.11	7.81	7.70	33.23	33.12	32.93	28.72	27.64	26.75
1050.000	1020.00	8.10	7.72	7.59	34.07	33.89	33.73	35.03	34.13	33.42
1113.300	1083.30	8.28	7.82	7.67	34.19	34.02	33.88	36.03	35.20	34.51
1200.000	1170.00	8.87	8.21	7.97	33.84	33.77	33.74	37.65	37.17	36.68
1303.300	1273.30	9.07	8.26	7.95	34.83	34.66	34.47	41.58	41.70	41.66
1430.000	1400.00	8.90	8.17	7.93	35.26	35.08	34.26	41.21	41.84	41.80
1556.700	1526.70	8.94	8.39	8.14	36.16	36.24	36.09	36.84	36.92	36.75
1683.300	1653.30	8.68	8.22	8.00	37.49	37.59	37.79	35.41	35.44	35.38
1800.000	1770.00	8.43	7.97	7.81	41.38	41.52	41.54	34.18	34.28	34.31
1873.300	1843.30	8.30	7.81	7.67	41.19	42.79	43.94	30.58	31.15	31.65
2000.000	1970.00	8.04	7.67	7.55	40.54	41.62	42.18	27.49	27.96	28.40

mixer VSWR

ϕ detection

freq. MHz	VSWR, RF port			VSWR, LO port			VSWR, IF port			max. output/DC offset vs. freq.			
	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	Freq. (MHz)	max. DC output mV	DC offset mV	
100.000	4.07	4.28	4.69	1.69	2.39	3.52	1.39	1.66	1.80	100.000	+147.31	+ .16	
161.290	4.07	4.10	4.48	1.76	2.47	3.31	1.34	1.55	1.69	132.110	+171.16	+ .15	
200.000	4.42	4.26	4.62	1.76	2.41	3.30	1.34	1.54	1.70	164.210	+185.12	+ .16	
283.870	4.45	4.09	4.37	1.73	2.31	3.07	1.34	1.55	1.67	200.000	+198.64	+ .15	
345.160	4.72	4.36	4.45	1.76	2.28	2.98	1.38	1.58	1.72	260.540	+207.88	+ .07	
406.450	4.43	4.06	4.14	1.77	2.27	2.88	1.46	1.65	1.77	324.750	+206.93	− .01	
500.000	4.30	3.75	3.82	1.74	2.04	2.81	1.65	1.84	2.02	388.960	+204.56	− .07	
590.320	3.71	3.40	3.52	1.73	1.99	2.53	1.94	2.15	2.34	421.070	+208.08	− .41	
712.900	3.32	2.84	3.00	1.80	1.91	2.35	2.48	2.77	3.03	500.000	+218.54	− .21	
835.480	3.07	2.60	2.66	1.93	1.83	2.19	3.39	3.70	4.14	613.710	+205.71	− .14	
958.060	2.92	2.44	2.45	1.92	1.70	2.00	4.70	5.30	5.75	710.030	+218.39	+ .06	
1019.400	2.89	2.39	2.39	1.94	1.65	1.89	5.27	5.93	6.35	838.460	+225.82	+ .08	
1100.000	2.89	2.55	2.44	1.98	1.55	1.71	6.09	5.97	6.51	934.780	+233.68	− .28	
1203.200	3.09	2.65	2.51	1.85	1.40	1.49	7.11	7.05	7.83	1000.000	+238.90	− .16	
1325.800	3.37	2.86	2.79	1.63	1.27	1.44	15.13	14.74	17.39	1100.000	+233.02	+ .25	
1500.000	3.65	3.06	3.00	1.42	1.06	1.45	17.39	17.39	17.39	1200.000	+224.34	+ .10	
1632.300	3.49	2.98	2.94	1.26	1.15	1.57	17.39	16.72	17.39	1300.000	+221.16	+5.03	
1754.800	3.34	2.92	2.84	1.11	1.26	1.67	13.92	11.61	15.00	1400.000	+214.63	+3.73	
1877.400	3.15	2.75	2.77	1.03	1.37	1.77	8.05	7.47	7.97	1500.000	+216.50	+1.92	
2000.000	3.02	2.69	2.72	1.11	1.40	1.80	4.74	4.38	4.41	1800.000	+215.48	+1.60	
											2000.000	+201.13	+1.94

Measurements at RF & LO Power +7 dBm

Mini-Circuits

P.O. BOX 166, Brooklyn, New York 11235 (718) 934-4500

mixer harmonic intermodulation

(relative to desired IF output)

RF ORDER HARMONIC	RF CAL										
	0	-	-	11	34	26	53	47	66	62	69
0	-	-	-	11	34	26	53	47	66	62	69
1	-	12	-	29	17	38	43	35	54	56	59
2	94	65	52	62	58	64	52	69	63	82	69
3	>94	53	43	52	43	52	50	65	67	48	62
4	92	83	79	>82	78	82	83	82	70	>85	81
5	>95	77	>84	74	65	74	60	67	64	70	>83
6	>89	>77	>84	>85	>84	>82	>84	>84	>84	>84	>82
7	>88	>77	>78	>83	>84	>83	78	>84	72	78	78
8	>90	>77	>77	>77	>85	>85	>84	>82	>83	>85	>85
9	>88	>77	>79	>77	>76	>85	>82	>83	>82	>83	>84
10	>88	>77	>77	81	>78	>78	>84	>83	>84	>81	>84
	0	1	2	3	4	5	6	7	8	9	10

Harmonics LO Order

test conditions: RF.=IN: FREQ. 1000.1 MHz DRIVE -3.99 DBM TESTED ON :15.10.84
 LO.=IN: FREQ. 970.01 MHz DRIVE +7.03 DBM TESTED BY :D.E.
 IF=MEASURED: FREQ. 30.09 AMP. = -11.78 DBM

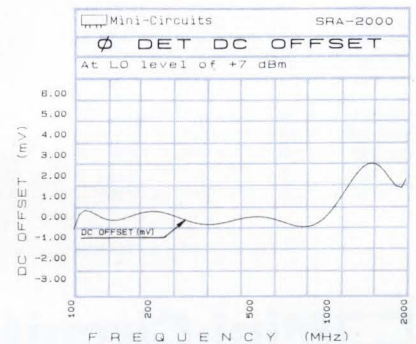
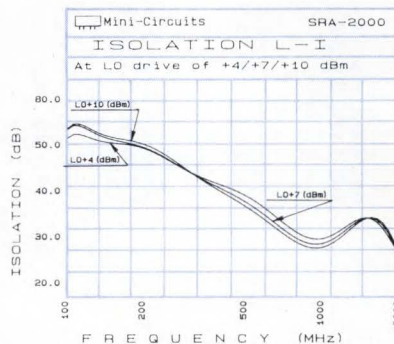
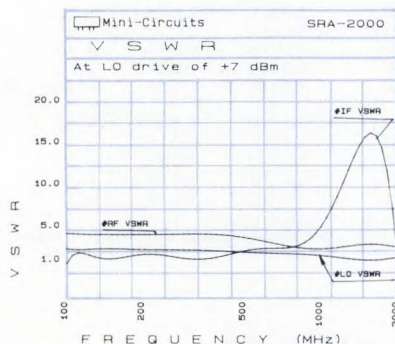
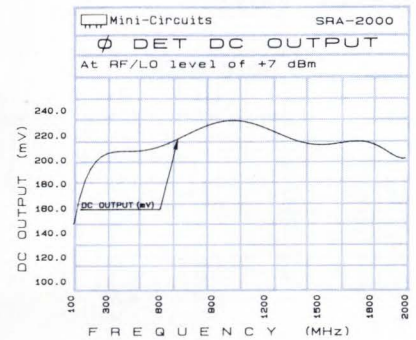
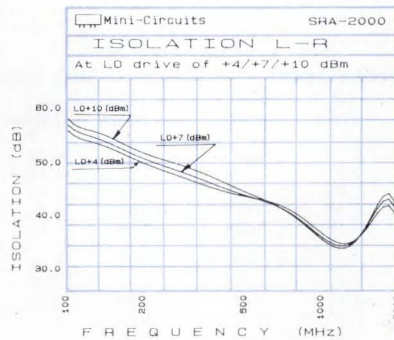
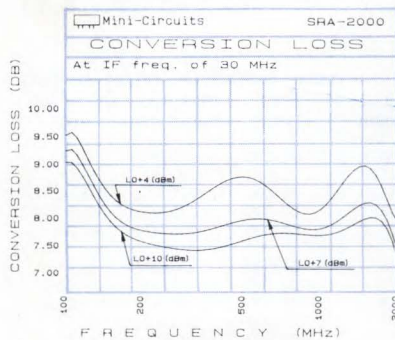
RF ORDER HARMONIC	RF CAL										
	0	-	-	1	24	16	41	34	53	45	58
0	-	-	-	1	24	16	41	34	53	45	58
1	-	12	-	28	17	37	42	30	50	49	48
2	>94	70	62	69	67	70	58	73	69	>73	>66
3	>94	70	60	68	60	70	65	>73	>74	63	>72
4	>95	>73	>73	>72	>74	>73	>74	>72	>73	>73	>73
5	>95	>74	>73	>73	>72	>74	>75	>74	>74	>72	>73
6	>89	66	>74	>74	>74	>73	>74	>74	74	>72	>74
7	>89	>66	>67	>73	75	>74	>73	>72	>73	>74	>74
8	>90	>67	>68	>67	>73	>73	>73	>73	>73	>74	>74
9	>89	>68	>67	>68	>67	>73	>74	>73	>73	>73	>73
10	>88	>68	>67	>68	>69	67	>72	>72	>73	>74	>73
	0	1	2	3	4	5	6	7	8	9	10

Harmonics LO Order

test conditions: RF.=IN: FREQ. 1000.1 MHz DRIVE -14.01 DBM
 TESTED ON :15.10.84
 LO.=IN: FREQ. 970.01 MHz DRIVE +6.94 DBM
 TESTED BY :D.E.
 IF=MEASURED: FREQ. 30.09 AMP. = -21.81 DBM

typical performance curves

(production unit)



most widely-used

Frequency Mixers

Models

SBL-1

LEVEL 7 (+7 dBm LO, up to +1 dBm RF)



computer-automated performance data
typical production unit / for data of other models consult factory

mixer conversion loss and isolation

RF MHz	LO MHz	Conversion Loss (dB)			Isolation L-R (dB)			Isolation L-I (dB)		
		LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm
1.000	31.00	6.99	6.67	6.45	62.73	> 67.00	68.01	61.88	65.61	> 70.00
2.000	32.00	6.50	6.24	6.05	61.86	> 67.00	67.46	61.93	> 67.00	> 70.00
5.000	35.00	5.96	5.74	5.60	61.73	64.84	66.12	62.43	> 67.00	> 70.00
10.000	40.00	5.85	5.58	5.46	61.35	64.19	65.15	61.72	64.81	66.04
20.000	50.00	5.96	5.67	5.51	60.14	62.22	62.01	60.33	61.69	61.30
32.188	62.19	5.86	5.60	5.51	58.85	59.04	58.99	58.27	57.74	57.09
50.000	80.00	5.84	5.60	5.49	56.98	56.71	55.75	54.84	54.39	53.61
78.970	48.97	5.83	5.56	5.44	54.05	52.21	50.75	51.16	49.67	48.53
100.000	70.00	5.74	5.52	5.43	51.39	49.41	48.33	48.54	46.90	46.10
156.940	126.94	5.69	5.53	5.47	45.18	44.20	43.99	42.22	41.66	41.56
200.000	170.00	5.85	5.68	5.60	41.88	41.56	41.75	39.00	38.98	39.65
203.720	173.72	5.83	5.67	5.56	41.46	41.05	41.34	38.60	38.52	39.23
250.500	220.50	5.80	5.63	5.47	40.14	40.04	40.21	37.21	37.29	37.77
297.290	267.29	5.77	5.61	5.48	36.89	36.90	37.90	33.86	33.97	34.98
344.070	314.07	5.93	5.81	5.72	36.80	37.11	37.44	33.43	33.88	34.36
375.260	345.26	6.28	6.13	5.97	34.83	36.02	37.25	31.69	32.79	34.20
406.440	376.44	6.27	6.15	6.07	33.09	34.80	36.66	29.68	31.05	32.79
437.630	407.63	6.38	6.08	5.88	32.48	33.79	35.38	29.38	30.39	31.81
468.820	438.82	6.48	6.00	5.73	32.24	32.80	34.05	29.76	30.12	30.96
500.000	470.00	6.90	6.31	5.99	32.48	32.36	33.04	30.19	30.37	30.65

mixer VSWR

φ detection

freq. MHz	VSWR, RF port			VSWR, LO port			VSWR, IF port			max. output/DC offset vs. freq.		
	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	Freq. (MHz)	max. DC output mV	DC offset mV
1.004	1.83	1.80	1.86	2.45	3.75	5.47	1.67	1.44	1.30	10.000	-233.19	+0.00
16.121	1.07	1.14	1.20	1.92	2.81	3.95	1.68	1.45	1.31	20.000	-230.80	-.01
20.000	1.06	1.14	1.20	1.94	2.89	3.95	1.68	1.44	1.31	38.000	-225.55	+0.00
31.242	1.06	1.14	1.20	1.93	2.83	3.88	1.68	1.44	1.32	50.000	-225.92	+0.00
50.000	1.07	1.15	1.20	1.83	2.69	3.54	1.69	1.46	1.33	66.000	-226.43	+0.00
76.605	1.08	1.16	1.21	1.84	2.72	3.70	1.71	1.48	1.36	80.000	-230.22	+ .01
100.000	1.09	1.17	1.22	1.82	2.62	3.38	1.74	1.52	1.39	100.000	-231.28	+ .03
121.970	1.11	1.18	1.24	1.82	2.62	3.53	1.79	1.55	1.42	136.000	-229.89	+ .08
152.210	1.13	1.20	1.25	1.88	2.66	3.42	1.85	1.62	1.50	178.000	-223.93	+ .17
182.450	1.15	1.22	1.27	1.83	2.62	3.21	1.93	1.69	1.57	200.000	-223.43	+ .15
200.000	1.12	1.26	1.27	1.87	2.58	3.22	1.98	1.77	1.62	234.000	-223.86	+ .23
242.940	1.19	1.26	1.32	1.89	2.56	3.19	2.11	1.88	1.74	262.000	-229.61	+ .25
273.180	1.21	1.28	1.34	1.90	2.59	3.17	2.21	1.99	1.86	304.000	-218.66	+ .32
318.540	1.23	1.30	1.35	1.99	2.64	3.25	2.35	2.11	1.95	360.000	-194.91	+ .72
348.780	1.24	1.31	1.36	2.01	2.59	3.18	2.38	2.15	2.03	402.000	-179.58	+ .97
379.030	1.24	1.30	1.34	2.03	2.60	3.15	2.45	2.24	2.09	444.000	-163.75	+ .88
409.270	1.23	1.28	1.32	2.12	2.72	3.19	2.46	2.24	2.11	458.000	-160.12	+ .78
424.390	1.21	1.27	1.31	2.20	2.77	3.27	2.50	2.30	2.16	472.000	-155.46	+ .60
454.630	1.19	1.24	1.28	2.30	2.82	3.34	2.46	2.32	2.14	486.000	-150.45	+ .39
500.000	1.16	1.21	1.25	2.40	3.01	3.54	2.43	2.23	2.12	500.000	-142.53	+ .23

Measurements at RF & LO Power +7 dBm

Mini-Circuits

P.O. BOX 166, Brooklyn, New York 11235 (718) 934-4500

mixer harmonic intermodulation

(relative to desired IF output)

RF ORDER HARMONIC	RF CAL	0	1	2	3	4	5	6	7	8	9	10
0	>93	-	45	50	36	56	49	65	47	66	52	68
1	>93	25	-	39	12	47	22	46	29	49	55	62
2	74	62	55	71	60	69	53	72	61	71	54	75
3	81	44	33	49	35	59	36	60	36	64	37	51
4	>93	80	70	66	58	75	62	79	59	78	69	76
5	>93	61	46	62	50	59	60	63	67	66	53	65
6	>93	88	78	78	74	75	69	75	70	78	66	76
7	>93	81	64	67	63	73	56	71	55	78	55	69
8	>93	>88	84	88	84	>86	83	>86	76	81	78	81
9	93	82	83	83	75	79	67	75	64	84	60	77
10	93	>87	87	>87	86	>88	86	>86	>86	>86	81	>86
		0	1	2	3	4	5	6	7	8	9	10
Harmonic LO Order												

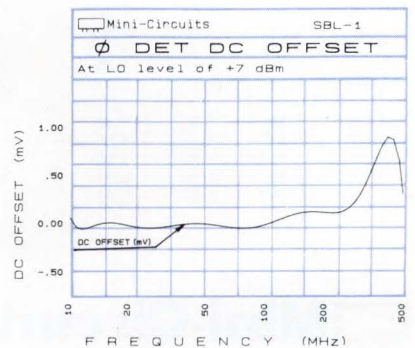
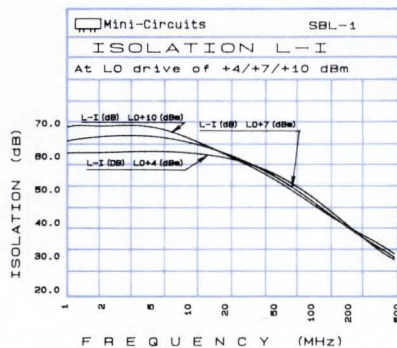
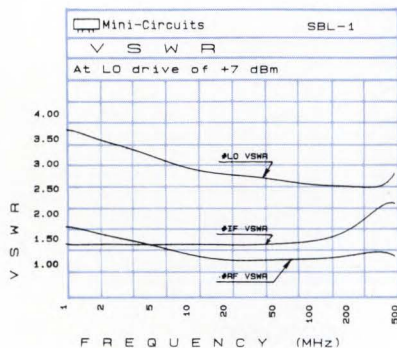
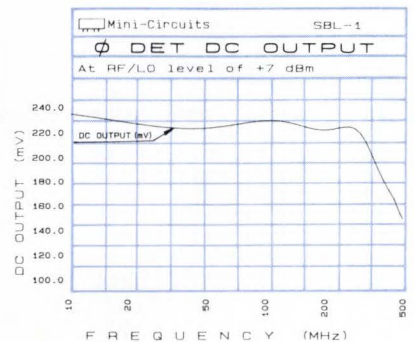
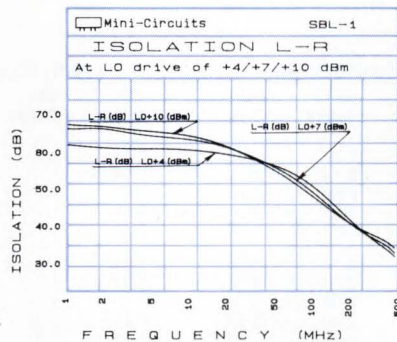
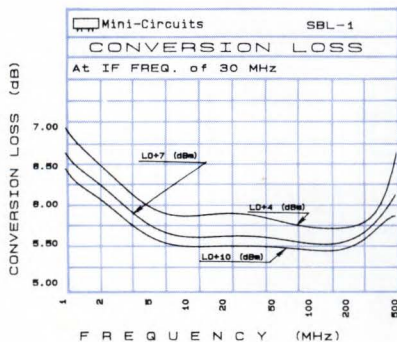
test conditions: RF=185.100 MHz INPUT P.=+0.00DBM
LO=155.010 MHz INPUT P.=+6.92DBM
IF=30.090 MHz IF AMPLIT.=-6.11 DBM

RF ORDER HARMONIC	RF CAL	0	1	2	3	4	5	6	7	8	9	10
0	>84	-	36	38	24	41	35	45	30	52	31	52
1	>84	25	-	38	12	50	19	41	21	37	40	47
2	82	63	55	68	54	66	52	64	52	66	54	74
3	>84	66	53	66	58	71	55	75	52	65	54	73
4	>84	>76	75	>76	75	>77	76	>77	75	>76	74	>76
5	>84	>76	>76	>76	>76	>76	>77	>77	73	>76	71	>76
6	>84	>78	>76	>76	>76	>76	>76	>77	>77	>77	>76	>76
7	>84	>78	>78	>76	>76	>76	>76	>76	>77	>77	>77	>76
8	>84	>78	>78	>78	>78	>76	>76	>76	>76	>77	>77	>77
9	>84	>78	>78	>78	>78	>78	>76	>76	>76	>76	>76	>77
10	>83	>77	78	>78	>78	>78	>78	>76	>76	>76	>76	>76
		0	1	2	3	4	5	6	7	8	9	10
Harmonic LO Order												

test conditions: RF=185.100 MHz INPUT P.=+10.03DBM
LO=155.010 MHz INPUT P.=+6.92DBM
IF=30.090 MHz IF AMPLIT.=-15.84 DBM

typical performance curves

(production unit)



most widely-used

Frequency Mixers

Models

LEVEL 7 (+7 dBm LO, up to +1 dBm RF)

SBL-1X



computer-automated performance data

typical production unit / for data of other models consult factory

mixer conversion loss and isolation

RF MHz	LO MHz	Conversion Loss (dB)			Isolation L-R (dB)			Isolation L-I (dB)		
		LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm
10.000	40.00	6.29	5.91	5.70	50.68	52.58	54.27	55.71	57.65	58.94
20.000	50.00	6.55	6.07	5.85	50.33	51.57	52.78	55.05	56.10	56.31
50.000	80.00	6.34	5.97	5.76	48.45	48.88	48.88	51.91	51.40	50.84
100.000	70.00	6.32	6.02	5.79	45.57	44.82	44.29	47.39	46.42	45.36
160.320	130.32	6.46	6.05	5.84	42.61	42.05	41.40	43.63	42.49	41.59
200.000	170.00	6.59	6.14	5.89	41.43	40.99	39.98	41.84	40.75	39.77
253.500	223.50	6.71	6.19	5.95	40.54	40.18	38.99	40.75	39.56	38.54
315.630	285.63	6.66	6.25	6.01	39.31	38.29	37.09	39.48	37.94	37.02
377.760	347.76	6.83	6.34	6.11	36.67	35.80	35.11	38.56	36.81	35.91
439.880	409.88	6.97	6.56	6.34	34.91	33.93	33.09	37.98	35.80	34.50
500.000	470.00	6.99	6.55	6.31	32.30	31.47	30.75	37.04	35.23	34.36
564.130	534.13	6.57	6.24	6.01	30.82	30.58	30.10	34.75	33.53	33.09
626.260	596.26	6.26	5.86	5.67	29.12	29.34	29.13	35.60	34.86	33.59
657.320	627.32	6.35	5.95	5.71	29.01	29.13	29.15	36.32	35.78	34.99
719.450	689.45	6.31	5.84	5.60	28.83	28.51	28.62	35.42	35.11	35.80
781.580	751.58	6.26	5.77	5.51	28.12	28.01	27.67	35.25	34.75	34.77
812.640	782.64	6.43	5.92	5.59	27.51	27.68	27.45	34.28	33.85	33.92
874.760	844.76	6.30	5.87	5.58	26.96	27.52	27.88	32.62	32.09	32.28
936.890	906.89	6.25	5.87	5.63	26.56	27.40	28.21	30.70	30.31	30.84
1000.000	970.00	6.33	6.04	5.90	26.20	27.28	28.39	30.15	30.12	30.53

mixer VSWR

freq. MHz	VSWR, RF port			VSWR, LO port			VSWR, IF port		
	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm
10.000	1.11	1.11	1.16	1.68	2.50	3.70	2.06	1.70	1.49
20.000	1.06	1.07	1.14	1.76	2.58	3.78	2.04	1.68	1.48
38.167	1.03	1.07	1.15	1.64	2.46	3.62	2.03	1.73	1.49
50.000	1.03	1.08	1.16	1.64	2.54	3.63	2.06	1.74	1.50
100.000	1.02	1.10	1.18	1.64	2.40	3.40	2.11	1.77	1.54
137.670	1.02	1.12	1.20	1.61	2.34	3.24	2.12	1.82	1.60
200.000	1.06	1.16	1.25	1.57	2.31	3.11	2.24	1.96	1.73
270.340	1.11	1.23	1.31	1.65	2.35	3.18	2.44	2.14	1.92
336.670	1.17	1.29	1.37	1.73	2.38	3.22	2.55	2.31	2.09
403.000	1.22	1.34	1.42	1.78	2.48	3.24	2.71	2.41	2.20
469.340	1.26	1.37	1.44	1.88	2.51	3.16	2.77	2.49	2.29
500.000	1.26	1.36	1.44	1.97	2.60	3.24	2.80	2.52	2.31
568.840	1.25	1.33	1.39	2.01	2.65	3.29	2.78	2.48	2.25
635.170	1.21	1.27	1.35	2.08	2.64	3.23	2.68	2.37	2.18
701.510	1.23	1.27	1.36	2.25	2.84	3.35	2.57	2.31	2.08
767.840	1.38	1.40	1.47	2.39	3.02	3.53	2.52	2.22	1.98
800.000	1.51	1.51	1.56	2.51	3.03	3.56	2.46	2.17	1.94
867.340	1.91	1.88	1.90	2.57	3.15	3.62	2.42	2.09	1.84
900.510	2.14	2.10	2.11	2.61	3.11	3.60	2.36	2.02	1.77
1000.000	2.99	2.89	2.87	2.68	3.07	3.50	2.24	1.95	1.71

Mini-Circuits

P.O. BOX 166, Brooklyn, New York 11235 (718) 934-4500

mixer harmonic intermodulation

(relative to desired IF output)

RF ORDER HARMONIC	RF CAL	0	1	2	3	4	5	6	7	8	9	10
0	90	-	31	23	43	46	41	42	32	53	67	61
1	90	18	-	34	18	32	34	36	35	43	61	58
2	77	47	56	46	58	45	55	64	57	56	40	58
3	90	46	37	47	38	52	35	47	48	51	56	54
4	90	77	79	59	69	54	67	53	70	82	73	62
5	90	75	77	70	52	61	49	58	48	71	82	63
6	90	76	78	77	81	68	70	67	70	62	76	75
7	90	78	75	78	77	75	71	64	65	66	59	78
8	90	79	80	79	78	78	83	83	75	73	75	68
9	90	79	79	78	78	78	77	83	78	74	71	71
10	90	78	79	78	79	78	78	77	83	83	80	77
		0	1	2	3	4	5	6	7	8	9	10

Harmonic LO Order

test conditions: RF=500.100 MHz INPUT P. = -3.91DBM
 LO=470.010 MHz INPUT P. = +7.13DBM
 IF=30.090MHz IF AMPLIT. = -10.78 DBM

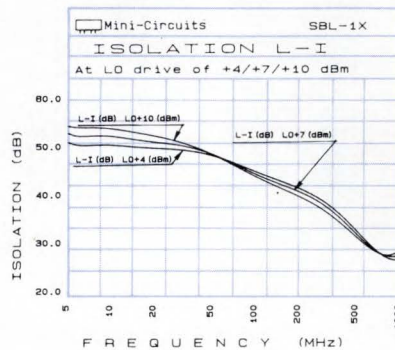
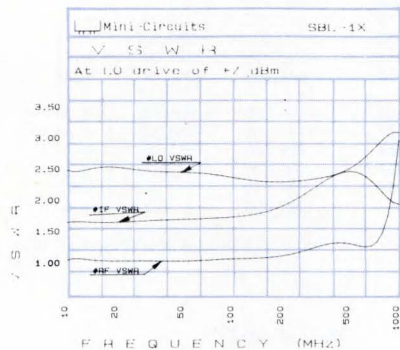
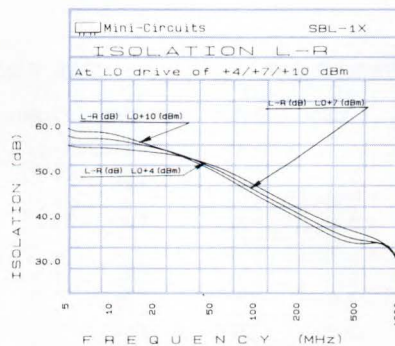
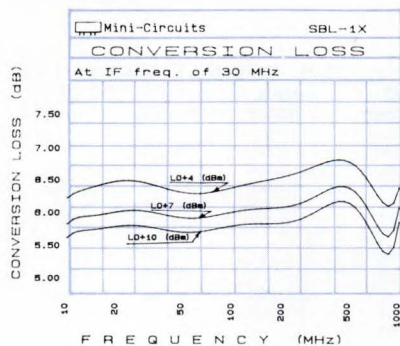
RF ORDER HARMONIC	RF CAL	0	1	2	3	4	5	6	7	8	9	10
0	>80	-	22	15	33	33	30	30	16	36	31	42
1	>80	19	-	31	19	29	30	31	31	35	48	41
2	>80	50	61	48	65	47	60	66	67	51	43	66
3	>80	69	56	64	54	66	52	70	72	66	65	68
4	>80	68	>73	72	>72	>72	>72	>71	>73	>72	67	68
5	>80	68	69	72	>73	>72	>72	>72	>71	>73	>73	67
6	>80	68	68	68	>73	>73	>72	>72	>72	>71	>73	>73
7	>80	68	67	68	67	>73	>73	>72	>72	>72	>72	>73
8	>80	69	69	69	68	67	>73	>73	>72	>72	>72	>72
9	>80	68	68	69	68	68	68	>73	>73	>72	>72	>72
10	>81	68	68	68	69	68	68	68	>73	>73	>71	>72
		0	1	2	3	4	5	6	7	8	9	10

Harmonic LO Order

test conditions: RF=500.100 MHz INPUT P. = -13.99DBM
 LO=470.010 MHz INPUT P. = +7.13DBM
 IF=30.090 MHz IF AMPLIT. = -20.88 DBM

typical performance curves

(production unit)



most widely-used

Frequency Mixers

LEVEL 7 (+7 dBm LO, up to +1 dBm RF)

Models

TFM-2
ZLW-2
ZEM-2
ZFM-2



computer-automated performance data
typical production unit / for data of other models consult factory

mixer conversion loss and isolation

RF MHz	LO MHz	Conversion Loss (dB)			Isolation L-R (dB)			Isolation L-I (dB)		
		LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm
1.000	31.00	7.65	7.23	7.05	> 64.00	> 67.00	> 70.00	> 64.00	> 67.00	> 70.00
2.000	32.00	6.99	6.50	6.38	> 64.00	> 67.00	> 70.00	> 64.00	> 67.00	> 70.00
5.000	35.00	6.14	5.80	5.68	> 64.00	> 67.00	> 70.00	> 64.00	> 67.00	> 70.00
10.000	40.00	6.01	5.62	5.47	> 64.00	> 67.00	> 70.00	> 64.00	> 67.00	> 70.00
20.000	50.00	6.10	5.68	5.51	> 64.00	> 67.00	> 70.00	> 64.00	> 67.00	> 70.00
50.000	80.00	5.94	5.58	5.44	> 64.00	61.94	60.30	> 64.00	63.74	61.51
100.000	70.00	5.88	5.53	5.39	56.03	54.33	53.23	55.98	54.76	53.55
167.340	137.34	5.89	5.57	5.44	50.05	48.65	48.08	48.75	47.61	47.01
233.870	203.87	6.02	5.72	5.54	46.08	45.10	44.88	43.82	43.03	43.10
300.400	270.40	5.74	5.45	5.37	43.14	42.56	42.56	40.29	40.00	40.23
366.940	336.94	6.01	5.73	5.58	40.77	40.45	40.57	37.73	37.57	38.18
466.740	436.74	6.15	5.82	5.66	38.41	38.33	38.72	33.78	34.32	35.36
500.000	470.00	6.05	5.72	5.56	38.98	38.80	39.09	33.83	34.10	34.86
599.810	569.81	6.34	6.02	5.78	38.50	37.43	36.87	32.71	32.81	32.88
666.340	636.34	6.54	6.11	5.88	38.54	37.94	37.43	31.60	31.57	31.51
799.410	769.41	7.07	6.27	5.92	35.96	36.06	36.24	29.94	29.67	29.67
832.680	802.68	7.29	6.46	6.03	35.29	35.22	35.39	28.80	28.79	28.42
899.210	869.21	7.77	7.00	6.39	34.14	33.77	33.77	26.59	26.14	25.92
932.480	902.48	8.11	7.37	6.84	33.72	33.17	33.14	25.85	25.03	24.52
1000.000	969.00	8.20	7.63	7.18	33.25	32.49	32.14	24.75	23.59	22.58

mixer VSWR

φ detection

freq. MHz	VSWR, RF port			VSWR, LO port			VSWR, IF port			max. output/DC offset vs. freq.		
	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	Freq. (MHz)	max. DC output mV	DC offset mV
5.001	1.26	1.30	1.34	1.77	2.70	4.33	1.43	1.24	1.09	1.000	-230.07	+ .09
10.000	1.12	1.15	1.20	1.71	2.63	3.91	1.44	1.25	1.10	2.000	-234.86	+ .09
20.000	1.04	1.07	1.15	1.76	2.77	3.95	1.43	1.25	1.10	5.000	-240.18	+ .08
50.000	1.02	1.06	1.15	1.69	2.55	3.74	1.44	1.25	1.11	20.000	-240.24	+ .09
100.000	1.06	1.07	1.14	1.63	2.41	3.37	1.45	1.27	1.13	50.000	-236.50	+ .09
155.760	1.09	1.09	1.14	1.61	2.37	3.24	1.49	1.31	1.18	100.000	-238.59	+ .08
200.000	1.12	1.11	1.14	1.54	2.29	3.18	1.54	1.36	1.23	161.970	-242.90	+ .06
306.520	1.18	1.16	1.16	1.53	2.20	2.95	1.66	1.48	1.35	200.000	-243.36	+ .02
366.820	1.21	1.18	1.17	1.52	2.16	2.89	1.75	1.57	1.44	290.750	-246.83	+ .11
427.130	1.23	1.20	1.18	1.52	2.13	2.83	1.84	1.66	1.53	322.940	-237.61	+ .11
500.000	1.26	1.22	1.21	1.55	2.06	2.74	1.97	1.77	1.66	387.330	-224.03	+ .01
547.740	1.28	1.23	1.22	1.53	2.13	2.70	2.04	1.88	1.78	451.720	-223.29	+ .22
608.040	1.30	1.26	1.24	1.50	2.09	2.65	2.02	1.87	1.77	500.000	-229.56	+ .23
668.340	1.34	1.29	1.27	1.51	2.09	2.65	2.07	1.90	1.81	580.490	-229.04	+ .37
728.650	1.38	1.34	1.32	1.56	2.04	2.69	2.08	1.91	1.83	644.880	-207.44	+ .48
788.950	1.44	1.40	1.38	1.61	2.13	2.69	2.07	1.91	1.82	709.270	-196.52	+1.06
849.260	1.51	1.47	1.46	1.63	2.19	2.70	2.02	1.86	1.77	773.660	-188.54	+ .83
909.560	1.58	1.55	1.54	1.67	2.24	2.78	1.93	1.77	1.68	838.040	-187.28	+ .49
969.860	1.68	1.66	1.66	1.74	2.28	2.85	1.81	1.66	1.57	902.430	-173.88	+ .72
1000.000	1.75	1.72	1.72	1.77	2.30	2.89	1.74	1.60	1.51	934.630	-171.49	+ .76
										1000.000	-178.52	+ .64

Measurements at RF & LO Power +7 dBm

Mini-Circuits

P.O. BOX 166, Brooklyn, New York 11235

(718) 934-4500

mixer harmonic intermodulation

(relative to desired IF output)

RF ORDER HARMONIC	RF CAL	0	1	2	3	4	5	6	7	8	9	10
0	>90	-	14	29	23	42	25	43	53	57	65	72
1	>90	20	-	29	12	34	25	47	35	42	57	57
2	76	52	40	58	40	58	41	50	48	66	53	68
3	86	46	49	50	49	53	49	52	48	58	57	51
4	84	73	73	65	62	66	59	66	55	65	65	70
5	85	77	76	84	63	64	60	59	60	59	68	71
6	85	78	79	78	82	79	79	76	75	75	74	79
7	85	79	78	77	79	82	80	81	80	80	79	78
8	86	79	80	79	78	78	>84	>84	>82	>82	81	>82
9	85	79	79	80	79	78	79	>84	>84	>82	>83	>82
10	86	79	79	79	79	80	79	>84	>84	>82	>83	>83
		0	1	2	3	4	5	6	7	8	9	10
Harmonic LO Order												

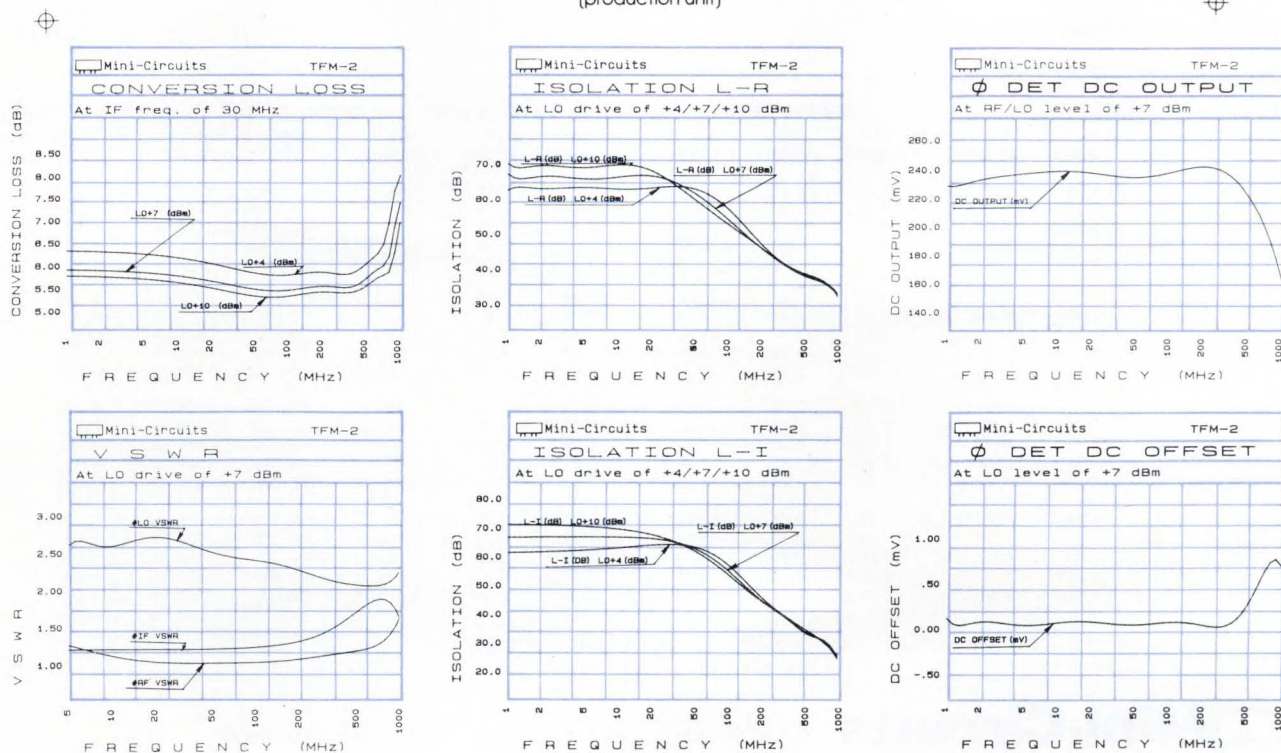
test conditions: RF=500.100 MHz INPUT P.₁= -3.98DBM
 LO=470.010 MHz INPUT P.₂= +6.86DBM
 IF=30.090 MHz IF AMPLIT.₁= -10.31 DBM

RF ORDER HARMONIC	RF CAL	0	1	2	3	4	5	6	7	8	9	10
0	>81	-	5	19	11	28	14	31	32	47	61	58
1	>81	19	-	32	12	30	24	44	35	36	59	49
2	>81	65	48	>72	48	64	47	58	54	63	60	65
3	>81	66	70	65	>72	64	68	64	72	68	68	66
4	>81	69	>74	>74	>72	>72	>72	>72	>74	>73	68	69
5	>81	68	68	>74	74	>72	>72	>72	>72	>74	>74	67
6	>81	69	69	68	>74	>74	>72	>72	>72	>72	>74	>74
7	>81	69	68	67	69	73	74	>72	>72	>72	>72	>74
8	>81	69	70	69	68	68	>74	>74	>72	>72	>72	>72
9	>81	69	69	69	69	69	68	>74	>74	>72	>72	>72
10	>80	69	69	70	70	69	69	68	>74	>74	>72	>72
		0	1	2	3	4	5	6	7	8	9	10
Harmonic LO Order												

test conditions: RF=500.100 MHz INPUT P.₁= -13.94DBM
 LO=470.010 MHz INPUT P.₂= +6.86DBM
 IF=30.090MHz IF AMPLIT.₁= -20.22 DBM

typical performance curves

(production unit)



most widely-used

Frequency Mixers

LEVEL 7 (+7 dBm LO, up to +1 dBm RF)

Models

TFM-3

ZFM-3



computer-automated performance data

typical production unit / for data of other models consult factory

mixer conversion loss and isolation

RF MHz	LO MHz	Conversion Loss (dB)			Isolation L-R (dB)			Isolation L-I (dB)		
		LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm
.040	30.04	6.45	6.15	6.01	> 64.00	> 67.00	> 70.00	> 64.00	> 67.00	> 70.00
.050	30.05	5.82	5.52	5.36	> 64.00	> 67.00	> 70.00	> 64.00	> 67.00	> 70.00
.070	30.07	5.44	5.12	4.99	> 64.00	> 67.00	> 70.00	> 64.00	> 67.00	> 70.00
.100	30.10	5.30	4.92	4.76	> 64.00	> 67.00	> 70.00	> 64.00	> 67.00	> 70.00
.500	30.50	5.10	4.77	4.60	> 64.00	> 67.00	> 70.00	> 64.00	> 67.00	> 70.00
1.000	31.00	5.07	4.76	4.59	> 64.00	> 67.00	> 70.00	62.64	63.53	> 70.00
5.000	35.00	4.91	4.75	4.56	> 64.00	> 67.00	> 70.00	59.16	60.91	64.41
10.000	40.00	4.87	4.75	4.56	> 64.00	> 67.00	> 70.00	58.46	60.97	63.86
20.000	50.00	4.98	4.74	4.60	> 64.00	> 67.00	63.79	57.26	58.52	60.41
60.871	90.87	4.87	4.73	4.60	51.05	50.40	50.16	49.67	49.37	49.56
100.000	70.00	4.76	4.63	4.51	44.79	44.80	44.88	43.57	44.05	44.87
162.610	132.61	4.94	4.79	4.70	38.73	39.22	39.57	38.80	39.87	40.79
200.000	170.00	5.13	4.95	4.84	36.77	37.18	37.12	36.43	37.86	38.79
230.440	200.44	5.11	4.89	4.78	35.18	35.78	35.97	36.79	37.67	38.36
281.310	251.31	5.16	5.05	4.93	33.40	33.68	33.93	34.86	35.71	35.77
315.230	285.23	5.38	5.25	5.22	34.35	34.22	34.07	33.94	33.98	33.69
349.140	319.14	5.60	5.32	5.18	36.71	35.64	34.41	36.04	34.07	32.17
366.100	336.10	5.72	5.37	5.15	36.71	35.56	34.41	37.45	34.58	31.91
383.050	353.05	5.85	5.44	5.19	36.26	35.25	34.16	36.77	34.26	31.46
400.000	370.00	6.20	5.56	5.18	35.85	34.72	33.54	34.74	32.46	29.98

mixer VSWR

φ detection

freq. MHz	VSWR, RF port			VSWR, LO port			VSWR, IF port			max. output/DC offset vs. freq.		
	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	Freq. (MHz)	max. DC output mV	DC offset mV
5.001	1.36	1.24	1.18	1.71	2.69	4.09	1.73	1.59	1.46	.040	+239.68	+ .03
10.000	1.36	1.25	1.18	1.64	2.55	3.82	1.74	1.59	1.47	.050	+241.65	+ .02
20.000	1.36	1.25	1.18	1.70	2.67	3.89	1.73	1.59	1.47	.100	+246.04	+ .02
29.688	1.35	1.24	1.17	1.70	2.63	3.95	1.72	1.59	1.47	.500	+247.27	+ .01
50.000	1.33	1.23	1.16	1.64	2.55	3.75	1.73	1.60	1.48	1.000	+249.11	+ .01
66.720	1.33	1.23	1.16	1.59	2.45	3.58	1.74	1.62	1.49	5.000	+239.67	+0.00
100.000	1.31	1.21	1.14	1.63	2.48	3.51	1.77	1.67	1.53	10.000	+239.13	+0.00
116.100	1.30	1.21	1.14	1.64	2.42	3.47	1.80	1.69	1.56	20.000	+238.04	+0.00
153.130	1.28	1.19	1.12	1.66	2.42	3.35	1.87	1.76	1.64	50.000	+236.98	+ .02
177.820	1.26	1.18	1.11	1.68	2.36	3.34	1.93	1.82	1.69	76.820	+238.73	+ .07
200.000	1.24	1.16	1.10	1.69	2.38	3.21	1.97	1.87	1.74	100.000	+239.43	+ .13
227.190	1.22	1.15	1.09	1.73	2.46	3.35	2.03	1.94	1.80	150.000	+235.41	+ .21
251.880	1.20	1.13	1.09	1.74	2.40	3.29	2.06	1.97	1.83	200.000	+239.94	+ .20
264.220	1.19	1.13	1.09	1.75	2.42	3.39	2.12	2.03	1.90	256.370	+229.27	+ .12
288.910	1.18	1.13	1.10	1.76	2.41	3.33	2.17	2.10	1.97	300.000	+224.42	+ .63
325.940	1.17	1.14	1.13	1.89	2.56	3.43	2.26	2.19	2.06	328.190	+216.15	+ .53
350.630	1.16	1.14	1.14	1.97	2.63	3.54	2.29	2.23	2.11	346.150	+208.91	+ .60
375.320	1.16	1.14	1.15	2.00	2.68	3.74	2.32	2.26	2.15	364.100	+198.11	+ .88
387.660	1.16	1.15	1.16	2.00	2.69	3.75	2.33	2.28	2.17	382.060	+190.39	+ .64
400.000	1.15	1.15	1.16	1.99	2.76	3.83	2.33	2.29	2.17	400.000	+182.44	- .09

Measurements at RF & LO Power +7 dBm

Mini-Circuits

P.O. BOX 166, Brooklyn, New York 11235

(718) 934-4500

mixer harmonic intermodulation

(relative to desired IF output)

RF CAL													
0	-	-	42	50	47	62	49	80	50	69	57	69	
1	-	35	-	42	11	45	18	57	24	60	32	55	
2	88	79	70	82	68	81	65	80	61	78	59	76	
3	87	56	53	55	48	55	45	56	49	53	47	54	
4	> 96	> 87	84	> 87	> 87	> 85	> 86	> 86	80	> 86	74	83	
5	> 96	69	70	70	62	71	59	71	57	68	57	66	
6	> 96	> 85	> 86	> 87	> 86	> 87	> 86	> 87	84	> 86	> 86	> 86	
7	> 95	84	> 85	84	> 85	85	82	> 86	75	> 85	71	83	
8	> 96	> 87	> 87	87	> 86	> 86	> 86	> 86	> 87	> 86	> 87	> 86	
9	> 95	> 88	81	> 87	81	> 86	79	> 86	80	> 87	81	> 86	
10	> 95	> 85	> 86	> 85	> 87	> 87	> 86	> 85	> 86	> 86	> 87	> 86	
		0	1	2	3	4	5	6	7	8	9	10	
Harmonic LO Order													

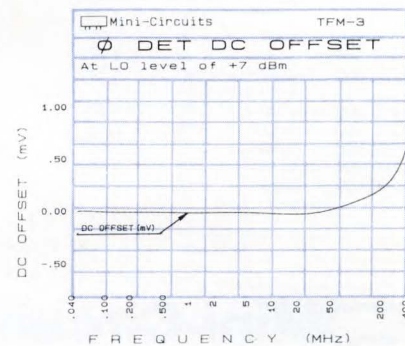
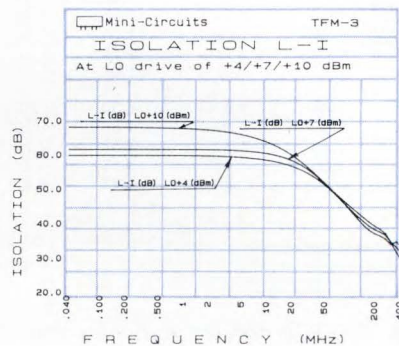
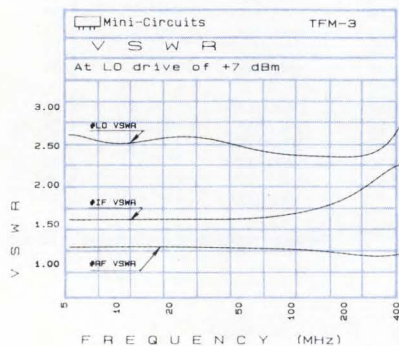
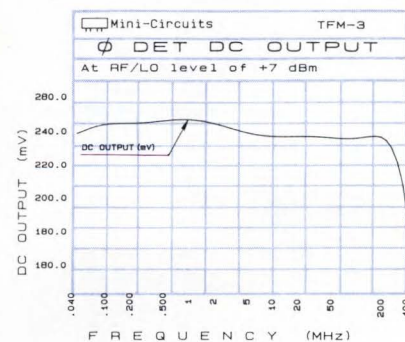
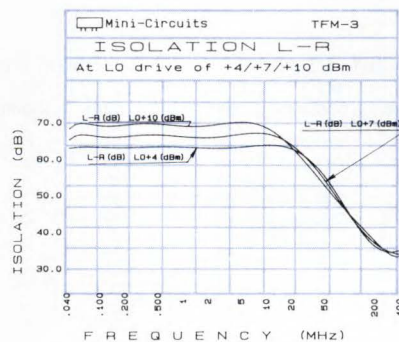
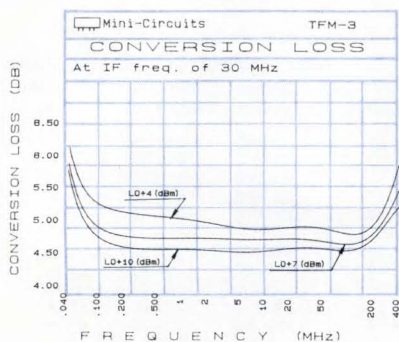
test conditions: RF.=IN: FREQ. 10.1 MHZ DRIVE -4.01 DBM
 TESTED ON: 16.10.84
 LO.=IN: FREQ. 40.01 MHZ DRIVE +7.03 DBM TESTED BY: D.E.
 IF=MEASURED: FREQ. 29.91 AMP. -9.18 DBM

RF CAL	0	-	31	40	35	52	36	55	35	52	38	55	
1	1	-	33	-	37	11	38	17	43	23	42	31	41
2	2	> 95	> 76	> 75	> 77	> 76	> 76	74	> 76	69	> 77	65	> 76
3	3	> 96	69	69	69	64	70	67	72	62	68	60	66
4	4	> 96	> 75	> 76	> 77	> 77	> 77	> 77	> 76	> 75	> 77	> 77	> 77
5	5	> 95	> 75	> 76	> 76	> 76	> 77	> 77	76	> 77	> 77	75	> 75
6	6	> 95	> 76	> 75	> 77	> 76	> 76	> 76	> 77	> 76	> 76	> 75	> 76
7	7	> 95	> 76	> 76	> 75	> 76	> 77	> 77	> 77	> 77	> 75	> 77	> 77
8	8	> 95	> 76	> 77	> 76	> 76	> 76	> 76	> 76	> 77	> 76	> 75	> 76
9	9	> 96	> 75	> 77	> 76	> 76	> 76	> 76	> 76	> 77	> 76	> 77	> 77
10	10	> 96	> 77	> 77	> 77	> 76	> 75	> 76	> 78	> 76	> 77	> 76	> 76
		0	1	2	3	4	5	6	7	8	9	10	

test conditions: RF.=IN: FREQ. 10.1 MHZ DRIVE -14.03 DBM
 TESTED ON: 16.10.84
 LO.=IN: FREQ. 40.01 MHZ DRIVE +7.08 DBM TESTED BY: D.E.
 IF=MEASURED: FREQ. 29.91 AMP. -19.19 DBM

typical performance curves

(production unit)



broadband, high dynamic range

Frequency Mixers

LEVEL 10 (+10dBm LO, up to +5dBm RF)

Models

TFM-15
ZFM-15



computer-automated performance data
typical production unit / for data of other models consult factory

mixer conversion loss and isolation

RF MHz	LO MHz	Conversion Loss (dB)			Isolation L-R (dB)			Isolation L-I (dB)		
		LO +7dBm	LO +10dBm	LO +13dBm	LO +7dBm	LO +10dBm	LO +13dBm	LO +7dBm	LO +10dBm	LO +13dBm
10.000	40.00	7.09	6.53	6.23	23.88	26.10	27.81	23.04	25.08	27.01
20.000	50.00	7.15	6.60	6.36	28.07	30.38	32.40	27.25	29.74	31.89
100.000	70.00	7.10	6.55	6.27	33.54	35.82	38.01	32.56	35.93	38.89
200.000	170.00	7.14	6.60	6.32	35.25	37.35	39.48	34.67	38.21	41.31
400.000	370.00	7.36	6.74	6.38	35.50	36.49	37.50	37.43	39.50	39.44
500.000	470.00	7.13	6.52	6.23	34.59	35.42	36.65	37.49	38.00	37.53
790.000	760.00	7.40	6.70	6.39	31.76	32.94	34.27	35.00	33.60	34.14
920.000	890.00	7.71	6.76	6.35	30.94	32.80	34.84	33.13	33.97	33.68
1180.000	1150.00	8.13	7.30	6.99	30.06	31.62	33.62	31.75	32.89	33.47
1310.000	1280.00	8.32	7.30	6.91	29.59	31.27	33.27	32.10	34.31	35.08
1500.000	1470.00	7.32	6.54	6.25	28.50	29.76	30.77	30.68	32.85	34.76
1700.000	1670.00	7.69	6.91	6.53	28.13	28.49	28.63	31.86	30.87	31.34
1830.000	1800.00	7.60	6.97	6.65	28.52	29.46	29.52	29.41	28.22	28.72
2000.000	1970.00	7.61	7.07	6.84	27.07	28.32	29.26	28.50	27.77	27.62
2200.000	2170.00	7.47	6.97	6.80	27.16	27.89	28.41	29.65	27.68	25.61
2480.000	2450.00	7.51	6.93	6.70	28.24	28.37	28.05	25.87	24.64	20.89
2610.000	2580.00	7.71	7.08	6.90	27.17	27.10	27.02	24.02	23.13	20.35
2740.000	2710.00	8.11	7.45	7.20	27.49	26.79	26.50	22.65	21.95	20.52
2870.000	2840.00	8.18	7.56	7.37	26.75	26.23	24.58	21.48	21.25	20.52
3000.000	2970.00	8.63	8.31	8.20	27.78	29.30	29.14	20.68	20.32	19.50

mixer VSWR

ϕ detection

freq. MHz	VSWR, RF port			VSWR, LO port			VSWR, IF port			max. output/DC offset vs. freq.		
	LO +7dBm	LO +10dBm	LO +13dBm	LO +7dBm	LO +10dBm	LO +13dBm	LO +7dBm	LO +10dBm	LO +13dBm	Freq. (MHz)	max. DC output mV	DC offset mV
10.000	2.11	1.84	1.62	1.62	1.71	2.26	1.56	1.45	1.39	10.000	+216.05	-2.26
20.000	1.77	1.54	1.35	1.26	1.51	2.32	1.48	1.29	1.22	20.000	+216.68	-1.18
50.000	1.75	1.50	1.30	1.08	1.37	2.18	1.50	1.25	1.17	50.000	+217.07	+1.25
100.000	1.81	1.55	1.33	1.07	1.44	2.07	1.53	1.26	1.17	100.000	+214.73	+1.40
200.000	2.02	1.72	1.48	1.23	1.40	1.96	1.56	1.27	1.19	200.000	+218.98	+1.57
316.150	2.26	1.99	1.72	1.43	1.34	1.78	1.56	1.26	1.20	324.690	+232.84	+1.80
500.000	2.79	2.45	2.22	1.75	1.33	1.57	1.55	1.23	1.19	414.600	+206.43	+1.02
622.300	3.09	2.70	2.51	1.96	1.36	1.40	1.52	1.20	1.16	500.000	+192.47	+1.93
851.920	3.28	2.85	2.67	2.19	1.36	1.11	1.43	1.16	1.07	639.370	+223.80	+1.05
1000.000	3.18	2.75	2.04	2.35	1.38	1.12	1.40	1.20	1.24	729.280	+205.59	+1.39
1200.000	2.64	2.28	1.96	1.98	1.30	1.33	1.48	1.37	1.14	800.000	+179.59	+1.40
1311.100	2.23	1.94	1.83	1.74	1.27	1.51	1.58	1.48	1.04	909.100	+183.16	+1.28
1500.000	1.63	1.44	1.52	1.27	1.29	1.75	1.74	1.56	1.19	1000.000	+190.29	+1.27
1617.300	1.38	1.25	1.27	1.12	1.34	1.92	1.76	1.52	1.37	1200.000	+196.42	+1.71
1770.400	1.49	1.42	1.24	1.08	1.34	1.98	1.59	1.31	1.62	1500.000	+178.74	+3.01
2000.000	2.09	1.97	1.83	1.50	1.44	1.89	1.34	1.14	1.87	1800.000	+175.84	+2.71
2200.000	2.17	2.18	2.12	1.71	1.52	1.60	1.37	1.30	1.80	2000.000	+195.03	+1.08
2500.000	2.63	2.37	2.45	2.94	1.93	1.31	2.37	2.66	1.72	2200.000	+171.75	-1.67
2800.000	2.10	2.09	1.95	2.96	2.25	2.04	3.68	3.79	3.80	2500.000	+177.30	-2.90
3000.000	2.21	2.18	2.28	3.00	2.63	1.80	3.82	4.88	3.98	2800.000	+163.24	-5.28
										3000.000	+180.13	-6.79

Measurements at RF & LO Power +10 dBm

Mini-Circuits

P.O. BOX 166, Brooklyn, New York 11235 (718) 934-4500

mixer harmonic intermodulation

(relative to desired IF output)

RF CAL													
0	-	-	22	24	16	31	30	32	36	45	48	65	
1	-	33	-	35	18	44	27	45	38	51	41	59	
2	94	69	57	52	56	61	52	48	63	47	52	50	
3	> 94	59	47	56	45	56	46	74	51	67	55	75	
4	93	77	82	> 83	75	80	72	77	70	80	80	65	
5	> 95	> 83	> 84	> 84	73	83	72	78	73	80	80	84	
6	> 90	> 77	> 83	> 83	> 85	> 84	> 84	> 84	> 84	> 84	> 82	> 84	
7	89	> 77	> 77	> 84	> 84	> 84	> 83	> 83	> 85	> 86	> 84	> 83	
8	> 89	> 78	> 78	> 77	> 84	> 84	> 85	> 82	> 84	> 84	> 84	> 83	
9	> 89	> 78	> 79	> 77	> 78	> 83	> 84	> 83	> 83	> 83	> 84	> 83	
10	89	> 79	78	> 78	> 78	> 76	> 84	> 84	> 84	> 83	> 84	> 83	
		0	1	2	3	4	5	6	7	8	9	10	
Harmonic LO Order													

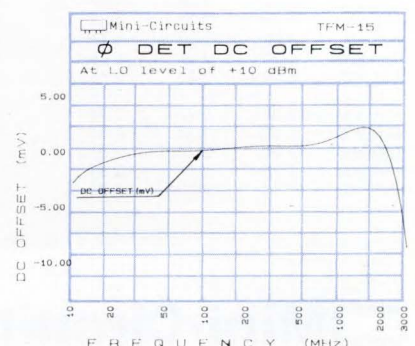
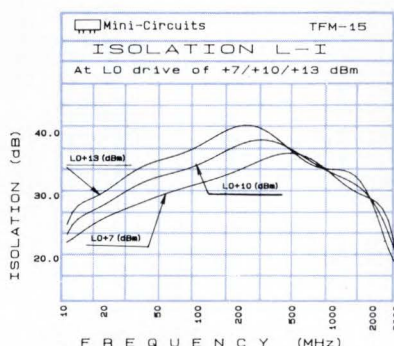
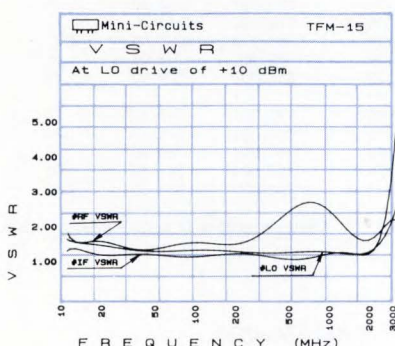
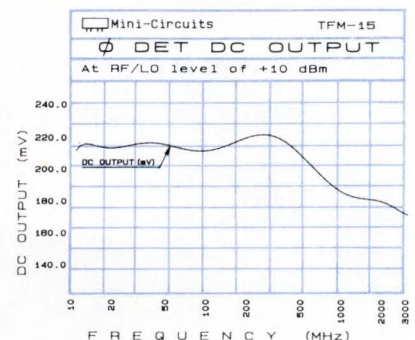
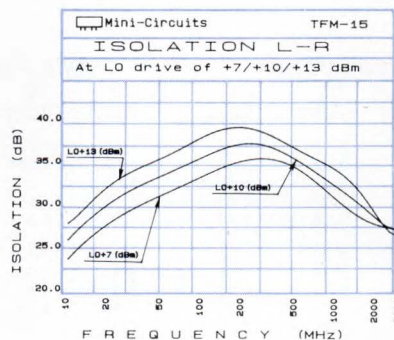
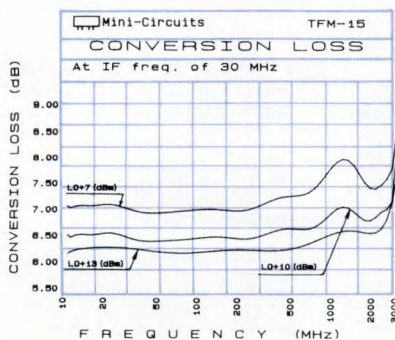
test conditions: RF = IN: FREQ. 1000.1 MHz DRIVE -4 DBM TESTED ON :16.10.84
 LO = IN: FREQ. 970.01 MHz DRIVE +9.98 DBM TESTED BY :D.E.
 IF = MEASURED: FREQ. 30.09 AMP. = -11.23 DBM

RF CAL													
0	-	-	12	15	6	19	20	18	24	28	36	41	
1	-	32	-	36	17	45	25	46	38	48	40	60	
2	>94	73	66	62	68	71	61	58	67	55	59	57	
3	>94	>73	68	>73	66	>73	67	73	70	>72	>74	>66	
4	>96	>73	>72	>73	>74	>74	>73	>74	>77	>74	>74	>74	
5	>96	>74	>74	>73	>74	>74	>74	>72	>74	>73	>74	>73	
6	>89	>69	>75	>75	>73	>73	>74	>75	>74	>72	>73	>74	
7	89	>67	>67	>73	>74	>74	73	>73	>74	>72	>73	74	
8	90	>68	>66	>68	>74	>75	>74	>73	>74	74	>73	73	
9	>89	>68	>68	>67	>68	>74	>75	>74	>73	>74	>75	>73	
10	>89	>69	>68	>68	>69	>68	>74	>73	>73	>74	>72	>75	
		0	1	2	3	4	5	6	7	8	9	10	
RF ORDER HARMONIC		Harmonic LO Order											

test conditions: RF = IN: FREQ. 1000.1 MHz DRIVE -14.07 DBM
 TESTED ON :16.10.84
 LO = IN: FREQ. 970.01 MHz DRIVE +9.98 DBM TESTED BY :D.E.
 IF = MEASURED: FREQ. 30.09 AMP. = -21.46 DBM

typical performance curves

(production unit)



very high dynamic range

Frequency Mixers

LEVEL 17 (+17 dBm LO, up to +10 dBm RF)

Models

SRA-173H



computer-automated performance data

typical production unit / for data of other models consult factory

mixer conversion loss and isolation

RF MHz	LO MHz	Conversion Loss (dB)			Isolation L-R (dB)			Isolation L-I (dB)		
		LO +14dBm	LO +17dBm	LO +20dBm	LO +14dBm	LO +17dBm	LO +20dBm	LO +14dBm	LO +17dBm	LO +20dBm
5.000	35.00	5.61	5.36	5.21	38.90	40.90	43.43	37.50	39.89	41.78
10.000	40.00	5.47	5.22	5.15	39.23	41.90	44.17	40.65	43.43	45.51
20.000	50.00	5.63	5.36	5.25	40.04	42.71	45.06	41.68	44.48	46.35
50.000	80.00	5.57	5.33	5.26	39.43	41.81	43.72	40.61	42.82	43.93
100.000	70.00	5.55	5.34	5.26	38.64	40.38	41.69	39.38	40.38	40.76
128.620	98.62	5.59	5.36	5.33	38.20	39.66	40.47	38.61	39.17	39.09
200.000	170.00	5.70	5.47	5.38	37.19	38.20	38.80	36.75	36.56	36.05
252.240	222.24	5.83	5.54	5.42	36.66	37.74	37.96	35.55	35.15	34.45
334.660	304.66	5.69	5.46	5.40	36.35	37.00	36.84	33.82	33.06	32.19
417.070	387.07	5.75	5.47	5.39	35.71	36.23	36.50	32.59	31.39	30.37
500.000	470.00	5.95	5.65	5.57	36.91	37.19	36.50	32.04	30.16	28.71
581.900	551.90	5.78	5.49	5.40	37.93	37.86	37.28	32.32	29.87	28.35
623.110	593.11	5.97	5.61	5.52	34.30	34.99	35.07	32.27	29.66	27.90
705.520	675.52	6.10	5.76	5.59	35.89	35.63	34.99	32.51	29.66	27.57
800.000	770.00	6.75	6.43	6.38	37.22	36.96	36.12	32.61	29.67	27.61
911.550	881.55	7.21	6.71	6.39	35.14	35.83	35.11	32.87	30.27	28.30
1000.000	970.00	7.15	6.65	6.34	35.08	33.44	31.61	33.03	32.10	30.71
1076.400	1046.40	7.01	6.45	6.20	36.33	35.45	33.54	30.48	31.19	31.23
1158.800	1128.80	7.04	6.29	6.04	34.81	35.75	35.82	33.57	36.16	37.63
1200.000	1170.00	6.80	6.08	6.01	34.39	34.68	34.53	34.21	37.45	39.04

mixer VSWR

φ detection

freq. MHz	VSWR, RF port			VSWR, LO port			VSWR, IF port			max. output/DC offset vs. freq.		
	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	Freq. (MHz)	max. DC output mV	DC offset mV
5.001	1.25	1.18	1.09	1.68	2.53	3.86	1.10	1.06	1.12	5.000	+397.20	-1.85
10.000	1.24	1.18	1.08	1.69	2.52	3.46	1.09	1.03	1.10	10.000	+397.00	-1.96
20.000	1.25	1.18	1.07	1.70	2.54	3.85	1.08	1.00	1.10	20.000	+392.50	-2.11
50.000	1.24	1.17	1.06	1.62	2.44	3.65	1.08	1.01	1.11	50.000	+385.40	-2.50
100.000	1.26	1.18	1.08	1.65	2.36	3.41	1.09	1.01	1.10	100.000	+390.90	-2.89
124.500	1.27	1.20	1.09	1.69	2.40	3.40	1.10	1.02	1.10	200.000	+397.50	-1.99
200.000	1.34	1.26	1.14	1.57	2.16	2.92	1.14	1.05	1.07	289.000	+407.20	-1.11
283.830	1.42	1.34	1.21	1.48	1.99	2.77	1.20	1.10	1.04	360.000	+387.50	+0.00
363.500	1.52	1.44	1.29	1.43	1.93	2.59	1.25	1.14	1.03	431.000	+334.40	-.48
443.160	1.67	1.56	1.40	1.32	1.75	2.37	1.31	1.20	1.06	537.500	+352.60	-1.94
500.000	1.76	1.66	1.47	1.28	1.67	2.21	1.36	1.25	1.10	608.500	+357.50	-4.39
602.500	1.95	1.85	1.61	1.26	1.55	2.01	1.42	1.32	1.18	679.500	+311.20	-3.23
682.160	2.12	2.01	1.76	1.24	1.40	1.87	1.46	1.38	1.27	750.500	+293.80	-2.37
761.830	2.37	2.24	1.98	1.20	1.29	1.70	1.55	1.48	1.39	800.000	+297.03	-1.95
841.490	2.59	2.43	2.15	1.23	1.21	1.60	1.64	1.59	1.52	857.000	+309.00	-1.18
921.160	2.82	2.66	2.31	1.20	1.17	1.52	1.74	1.71	1.66	928.000	+319.80	-.76
1000.000	2.92	2.61	2.37	1.24	1.20	1.52	1.81	1.79	1.75	1000.000	+346.00	-.84
1080.500	2.99	2.78	2.46	1.31	1.32	1.54	1.91	1.88	1.83	1100.000	+353.40	-.53
1160.200	2.78	2.59	2.33	1.39	1.48	1.64	1.85	1.83	1.78	1150.000	+361.10	-.93
1200.000	2.68	2.53	2.26	1.49	1.59	1.73	1.87	1.84	1.81	1200.000	+351.60	-1.13

Measurements at RF & LO Power +17 dBm

Mini-Circuits

P.O. BOX 166, Brooklyn, New York 11235 (718) 934-4500

mixer harmonic intermodulation (relative to desired IF output)

RF ORDER HARMONIC	RF CAL	0	1	2	3	4	5	6	7	8	9	10
0	-	-	14	29	36	38	29	28	47	42	40	61
1	-	23	-	34	18	44	30	50	35	57	54	43
2	77	49	42	43	53	48	68	59	53	48	53	54
3	>94	69	45	62	41	60	48	62	57	58	61	63
4	>96	71	76	68	66	64	68	65	71	81	75	67
5	>96	82	76	81	70	78	64	75	67	77	84	74
6	>90	79	>93	>86	>89	79	81	77	>84	78	>86	>87
7	>88	>86	>85	>93	>94	>93	>90	>93	>86	>83	>89	>88
8	>89	>87	>87	>87	>93	>92	>92	>90	>94	>86	>93	>89
9	>90	>87	>89	>88	>88	>92	>92	>93	>93	>92	>93	>92
10	>90	>88	>87	>87	>88	>87	>94	>93	>93	>93	>93	>92

Harmonic LO Order

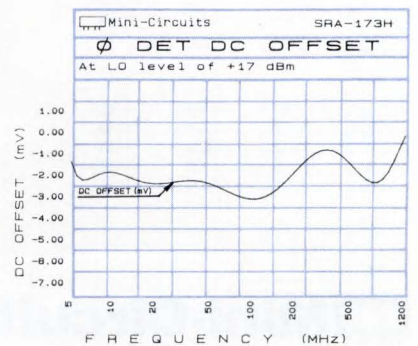
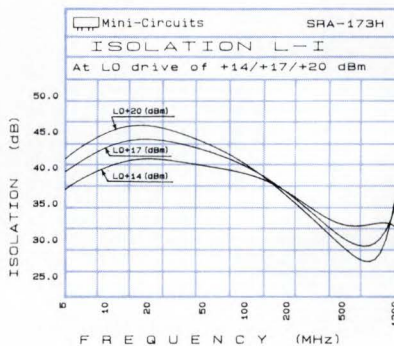
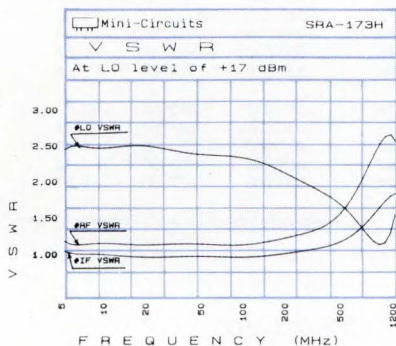
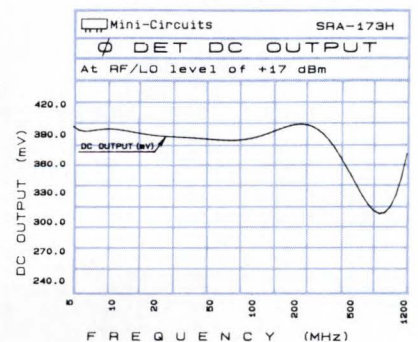
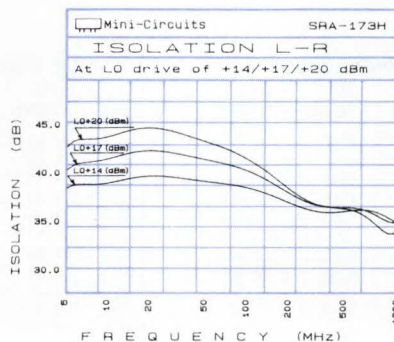
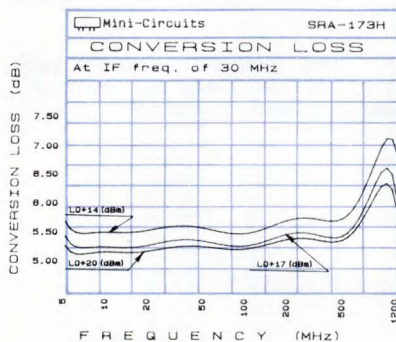
test conditions: RF = IN: FREQ. 10.1 MHZ DRIVE -14.03 DBM TESTED ON :16.10.84
LO = IN: FREQ. 40.01 MHZ DRIVE +7.08 DBM TESTED BY :D.E.
IF = MEASURED: FREQ. 29.91 AMP. -19.1 DBM

RF ORDER HARMONIC	RF CAL	0	1	2	3	4	5	6	7	8	9	10
0	-	-	4	18	25	27	19	17	32	31	29	48
1	-	23	-	33	18	43	31	47	36	55	43	39
2	>95	56	52	51	60	56	72	70	61	59	61	59
3	>94	>83	64	81	61	74	68	77	74	73	73	75
4	>95	>85	>81	>81	>83	>83	>83	>82	>83	>83	83	>83
5	>95	>86	>83	>83	>83	83	>82	>84	>82	>84	>85	>83
6	>89	>78	>83	>83	>83	>82	>83	>82	>84	>81	>82	>85
7	>89	>76	>77	>82	>83	>83	>82	>84	>83	>84	>82	>82
8	>89	>78	>77	>77	>84	>84	>84	>81	>83	>83	>83	>84
9	>88	>77	>77	>76	>77	>84	>83	>84	>82	>83	>83	>85
10	>89	>76	>77	>78	>78	>76	>84	>83	>83	>82	>83	>83

Harmonic LO Order

test conditions: RF = IN: FREQ. 1000.1 MHZ DRIVE -5.06 DBM
TESTED ON :16.10.84
LO = IN: FREQ. 970.01 MHZ DRIVE +16.97 DBM TESTED BY :D.E.
IF = MEASURED: FREQ. 30.09 AMP. -11.97 DBM

typical performance curves (production unit)



very low distortion

Frequency Mixers

LEVEL 17S (+17dBm LO, up to +14dBm RF)

Models

TFM-1H
TAK-1H
ZFM-1H
ZLW-1SH
ZAD-1SH



computer-automated performance data
typical production unit / for data of other models consult factory

mixer conversion loss and isolation

RF MHz	LO MHz	Conversion Loss (dB)			Isolation L-R (dB)			Isolation L-I (dB)		
		LO +14dBm	LO +17dBm	LO +20dBm	LO +14dBm	LO +17dBm	LO +20dBm	LO +14dBm	LO +17dBm	LO +20dBm
2.000	32.00	6.99	6.30	5.96	59.73	62.98	64.42	49.91	52.28	53.48
5.000	35.00	6.55	5.95	5.64	58.95	62.06	63.57	50.65	52.79	53.94
10.000	40.00	6.49	5.92	5.61	58.36	60.47	61.17	50.51	52.35	53.27
20.000	50.00	6.50	5.91	5.56	56.65	57.14	56.42	49.94	51.13	51.39
34.130	64.13	6.36	5.81	5.52	54.15	53.27	52.36	49.01	49.30	48.99
50.000	80.00	6.25	5.72	5.45	51.52	50.24	49.08	47.71	47.27	46.43
66.260	96.26	6.18	5.66	5.41	49.53	48.03	46.97	46.55	45.61	44.80
82.325	112.33	6.26	5.71	5.44	47.86	46.33	45.28	45.48	44.27	43.40
100.000	130.00	6.11	5.63	5.41	46.57	44.99	43.58	44.56	43.26	41.99
130.520	160.52	6.17	5.61	5.39	45.09	43.18	41.88	43.49	41.91	40.57
162.650	192.65	6.18	5.61	5.47	43.61	41.46	40.35	42.55	40.45	39.27
200.000	230.00	5.98	5.60	5.49	42.31	40.12	38.78	41.40	39.22	37.84
259.040	289.04	5.65	5.42	5.35	39.68	38.10	36.88	38.80	37.51	36.43
307.240	337.24	5.78	5.62	5.51	39.02	37.54	36.24	37.22	36.13	34.78
355.430	385.43	6.08	5.86	5.65	38.51	37.41	36.33	37.11	36.94	36.74
387.560	417.56	6.14	5.92	5.76	37.04	36.35	35.45	36.53	35.99	35.89
435.760	465.76	6.05	5.81	5.70	36.29	35.35	33.81	34.02	33.91	32.80
467.890	497.89	6.02	5.90	5.85	36.52	36.34	34.94	33.70	33.81	33.32
483.950	513.95	6.15	6.08	6.03	36.00	36.44	35.92	33.21	33.54	33.58
500.000	530.00	6.33	6.27	6.18	35.43	36.27	36.07	32.39	33.21	33.60

mixer VSWR

ϕ detection

freq. MHz	VSWR, RF port			VSWR, LO port			VSWR, IF port			max. output/DC offset vs. freq.		
	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	LO +4dBm	LO +7dBm	LO +10dBm	Freq. (MHz)	max. DC output mV	DC offset mV
5.002	1.28	1.22	1.25	1.27	1.67	2.71	1.51	1.33	1.25	2.000	-896.40	+ .84
10.000	1.20	1.10	1.14	1.20	1.60	2.58	1.51	1.34	1.25	5.000	-910.70	+ .82
20.000	1.16	1.03	1.09	1.07	1.63	2.60	1.51	1.33	1.25	10.000	-925.30	+ .82
35.938	1.14	1.02	1.10	1.08	1.61	2.56	1.50	1.33	1.25	20.000	-928.20	+ .82
50.000	1.14	1.04	1.12	1.13	1.58	2.55	1.51	1.34	1.26	50.000	-907.30	+ .86
82.345	1.14	1.06	1.13	1.12	1.57	2.33	1.52	1.36	1.27	70.688	-918.40	+ .93
100.000	1.15	1.07	1.14	1.11	1.55	2.46	1.55	1.38	1.29	100.000	-923.40	+ .89
128.750	1.15	1.08	1.15	1.12	1.54	2.30	1.58	1.41	1.32	122.200	-943.50	+ .97
175.160	1.18	1.09	1.16	1.10	1.57	2.33	1.68	1.49	1.41	156.550	-957.90	+ 1.21
200.000	1.18	1.10	1.16	1.08	1.55	2.24	1.73	1.54	1.45	173.720	-976.00	+ 1.21
252.500	1.20	1.10	1.16	1.06	1.55	2.23	1.89	1.70	1.60	200.000	-989.10	+ 1.53
298.910	1.21	1.08	1.15	1.08	1.60	2.29	2.12	1.85	1.72	242.410	-1025.60	+ 1.08
329.850	1.21	1.07	1.14	1.11	1.67	2.37	2.30	1.96	1.83	276.750	-1017.80	+ 1.54
360.790	1.20	1.06	1.13	1.16	1.70	2.33	2.43	2.10	1.91	300.000	-987.00	+ 1.77
391.730	1.19	1.05	1.12	1.20	1.76	2.38	2.63	2.24	2.05	328.270	-939.20	+ 2.14
422.660	1.17	1.04	1.12	1.21	1.82	2.41	2.86	2.38	2.19	362.610	-883.40	+ 1.02
453.600	1.14	1.05	1.13	1.28	1.84	2.51	3.02	2.52	2.28	400.000	-847.50	+ .71
469.070	1.12	1.06	1.14	1.31	1.85	2.49	3.14	2.61	2.35	431.300	-861.90	+ 1.38
484.540	1.10	1.08	1.16	1.38	1.87	2.48	3.22	2.69	2.43	465.640	-903.30	+ 1.34
500.000	1.08	1.09	1.17	1.42	1.90	2.52	3.27	2.73	2.44	500.000	-877.00	+ 1.67

Measurements at RF & LO Power +17 dBm

Mini-Circuits

P.O. BOX 166, Brooklyn, New York 11235 (718) 934-4500

mixer harmonic intermodulation

(relative to desired IF output)

RF ORDER HARMONIC	RF CAL												
	0	-	-	29	52	28	50	35	50	44	54	49	66
	1	-	-	25	38	14	45	34	38	33	43	32	47
	2	64	>65	56	>72	54	>73	52	>72	55	>78	57	>65
	3	68	60	55	>64	62	>67	51	>73	45	60	43	58
	4	>95	>89	77	84	71	81	73	81	>95	79	72	83
	5	>95	82	67	73	65	74	56	73	55	75	55	84
	6	>96	86	78	>91	77	89	76	86	78	86	84	>91
	7	>95	86	76	>94	81	85	71	82	66	82	65	84
	8	>94	>94	82	>91	85	>94	84	>92	86	>95	>90	>95
	9	94	>94	>94	>95	83	>90	82	>90	80	>94	77	>94
	10	>95	>93	>94	>94	>91	>95	>93	>95	>92	>95	>94	>94
		0	1	2	3	4	5	6	7	8	9	10	

Harmonic LO Order

test conditions: RF.=IN: FREQ.185.1 MHZ DRIVE +4.97 DBM TESTED ON :17.10.84
 LO.=IN: FREQ.155.01 MHZ DRIVE +16.91 DBM TESTED BY :D.E.
 IF=MEASURED: FREQ.30.09 AMP. =-.93 DBM

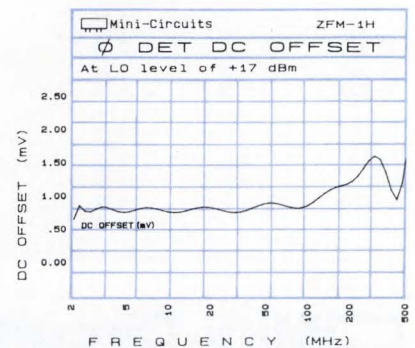
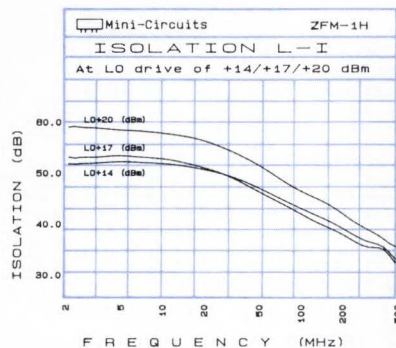
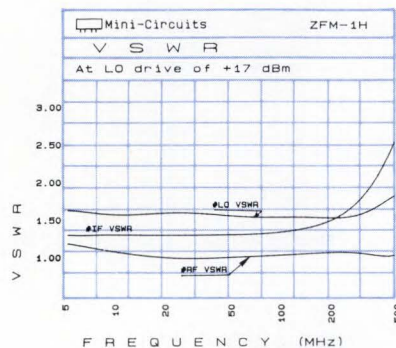
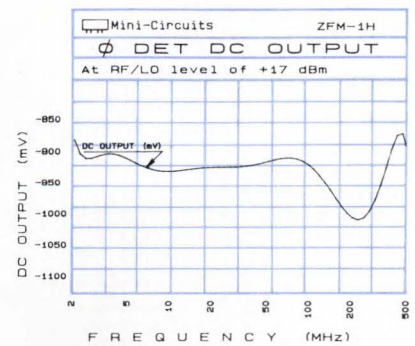
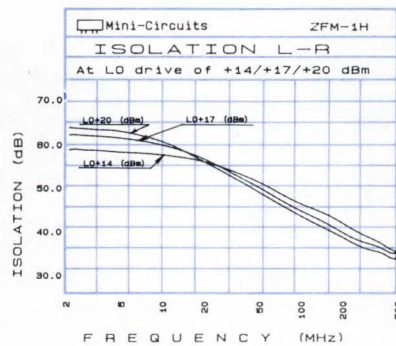
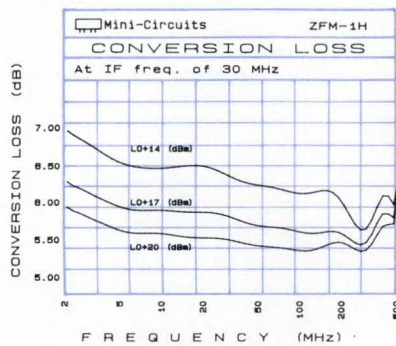
RF ORDER HARMONIC	RF CAL												
	0	-	-	20	42	17	41	23	39	32	39	32	50
	1	-	25	-	39	15	44	54	35	29	38	24	41
	2	83	>77	58	71	58	69	60	69	64	>77	65	>82
	3	95	71	62	74	59	72	54	78	53	74	54	72
	4	>95	>85	80	>86	79	>84	83	>84	>84	>86	82	>86
	5	>96	>85	>85	>85	84	>84	80	85	79	86	82	>86
	6	>94	>84	>84	>85	>84	>84	84	87	>85	>85	85	>84
	7	>94	>85	>85	>84	>83	>85	>84	>85	>84	>84	>85	>83
	8	>95	>84	84	>84	>85	>85	>85	>84	>85	>84	>85	>84
	9	>95	>84	>84	85	>85	>84	>85	>85	>85	85	>84	>84
	10	>94	>84	>84	>83	>84	>84	>83	>84	>85	>84	>85	>84
		0	1	2	3	4	5	6	7	8	9	10	

Harmonic LO Order

test conditions: RF.=IN: FREQ.185.1 MHZ DRIVE -4.95 DBM TESTED ON :17.10.84
 LO.=IN: FREQ.155.01 MHZ DRIVE +16.91 DBM TESTED BY :D.E.
 IF=MEASURED: FREQ.30.09 AMP. =-10.85 DBM

typical performance curves

(production unit)



ultra-low distortion

Frequency Mixers

LEVEL 23 (+23dBm LO, up to +15dBm RF)

Models

RAY-1

ZMY-1

ZAY-1



computer-automated performance data

typical production unit / for data of other models consult factory

mixer conversion loss and isolation

RF MHz	LO MHz	Conversion Loss (dB)			Isolation L-R (dB)			Isolation L-I (dB)		
		LO +20dBm	LO +23dBm	LO +26dBm	LO +20dBm	LO +23dBm	LO +26dBm	LO +20dBm	LO +23dBm	LO +26dBm
5.000	35.00	6.50	6.52	6.53	61.85	57.02	53.70	79.05	82.02	>86.00
10.000	40.00	6.43	6.40	6.48	60.36	56.72	53.82	79.25	82.32	>86.00
20.000	50.00	6.40	6.40	6.49	56.74	54.48	52.00	79.36	81.28	81.01
35.938	65.94	6.43	6.43	6.53	52.88	51.51	49.99	76.65	75.99	75.33
50.000	80.00	6.38	6.40	6.51	50.10	48.82	47.85	72.70	72.57	68.82
82.345	52.35	6.37	6.39	6.59	45.91	45.62	45.16	66.35	62.91	60.22
100.000	70.00	6.33	6.36	6.56	44.28	44.05	43.27	61.72	58.66	56.52
144.220	114.22	6.45	6.53	6.64	41.58	41.60	41.21	54.43	53.71	54.55
175.160	145.16	6.63	6.68	6.77	39.88	40.04	39.24	51.26	51.38	50.90
200.000	170.00	6.68	6.69	6.76	39.60	39.45	38.48	50.04	50.73	50.65
221.570	191.57	6.49	6.52	6.62	36.79	36.41	37.51	45.90	46.45	49.56
252.500	222.50	6.51	6.52	6.61	36.84	36.33	36.92	47.05	47.23	49.54
283.440	253.44	6.62	6.64	6.77	37.32	36.36	36.25	47.30	47.98	49.23
314.380	284.38	6.70	6.74	6.84	37.11	36.35	36.04	46.09	46.73	48.01
345.320	315.32	6.67	6.62	6.75	34.44	33.85	34.16	42.98	44.99	48.25
376.260	346.26	6.57	6.50	6.57	30.62	30.50	31.71	40.13	41.75	42.64
407.190	377.19	6.63	6.43	6.39	32.30	32.89	32.68	41.52	42.28	41.96
438.130	408.13	6.83	6.50	6.32	34.18	33.81	34.16	42.37	42.66	43.08
469.070	439.07	7.31	6.81	6.64	34.59	33.63	34.33	42.39	41.41	40.68
500.000	470.00	7.15	6.62	6.62	34.79	34.24	34.04	40.74	40.42	39.86

mixer VSWR

ϕ detection

freq. MHz	VSWR, RF port		VSWR, LO port		VSWR, IF port		max. output/DC offset vs. freq.		
	LO +20dBm	LO +23dBm	LO +20dBm	LO +23dBm	LO +20dBm	LO +23dBm	Freq. (MHz)	max. DC output mV	DC offset mV
5.001	1.26	1.29	1.88	2.50	1.47	1.33	5.000	-1385.80	-1.23
10.000	1.12	1.14	1.80	2.37	1.47	1.33	10.000	-1409.30	-1.23
20.000	1.03	1.06	1.85	2.33	1.48	1.33	20.000	-1383.10	-1.25
35.938	1.01	1.05	1.82	2.31	1.48	1.33	36.344	-1343.30	-1.31
50.000	1.03	1.07	1.85	2.37	1.47	1.34	50.000	-1331.10	-1.34
82.345	1.06	1.08	1.76	2.20	1.51	1.36	70.688	-1336.80	-1.35
100.000	1.07	1.10	1.77	2.25	1.53	1.39	87.860	-1376.40	-1.51
144.220	1.11	1.12	1.72	2.11	1.62	1.45	100.000	-1386.40	-1.35
175.160	1.13	1.14	1.80	2.25	1.66	1.51	139.380	-1311.20	-1.32
200.000	1.15	1.16	1.68	2.06	1.74	1.56	173.720	-1328.90	-1.90
221.570	1.17	1.18	1.76	2.17	1.78	1.61	200.000	-1376.10	-1.77
252.500	1.19	1.20	1.67	2.04	1.87	1.67	242.410	-1327.70	-1.60
283.440	1.21	1.22	1.74	2.10	1.82	1.66	276.750	-1361.20	-2.85
314.380	1.24	1.24	1.68	1.96	1.98	1.79	300.000	-1342.10	-2.44
345.320	1.26	1.26	1.75	2.04	2.06	1.87	345.440	-1273.10	-3.00
376.260	1.29	1.29	1.70	1.96	2.13	1.91	379.780	-1214.40	-.53
407.190	1.31	1.31	1.69	1.95	2.18	1.96	400.000	-1216.90	-1.82
438.130	1.34	1.35	1.67	1.90	2.23	2.01	431.300	-1282.30	+.07
469.070	1.37	1.38	1.63	1.87	2.25	2.04	465.640	-1220.50	+.70
500.000	1.43	1.44	1.60	1.83	2.26	2.05	500.000	-1228.50	-2.86

Measurements at RF & LO Power +23 dBm

Mini-Circuits

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mixer harmonic intermodulation

(relative to desired IF output)

RF ORDER HARMONIC	RF CAL												
	0	-	-	19	37	32	44	30	50	34	58	46	61
	1	-	21	-	33	11	39	18	49	24	43	36	49
	2	63	56	42	>66	47	>65	49	>64	47	>67	46	>61
	3	73	53	42	52	56	57	49	57	42	57	42	64
	4	>85	71	61	77	60	77	59	70	63	69	58	69
	5	>86	64	56	64	59	70	53	67	53	70	53	76
	6	>86	75	62	>82	70	>80	70	78	66	>84	72	>82
	7	>86	69	65	>80	62	74	64	75	69	77	67	>80
	8	>86	>83	78	>89	75	>87	>81	>85	>79	>88	>79	>87
	9	>85	>86	74	>83	>81	>88	>84	>81	76	>85	73	>88
	10	>85	>88	>80	>88	>88	>88	>85	>89	>88	>88	>79	>89
		0	1	2	3	4	5	6	7	8	9	10	

Harmonic LO Order

test conditions: RF = IN: FREQ. 185.1 MHZ DRIVE +9.98 DBM
 TESTED ON: 17.10.84
 LO = IN: FREQ. 155.01 MHZ DRIVE +22.98 DBM TESTED BY: D.E.
 IF = MEASURED: FREQ. 30.09 AMP. +3.07 DBM

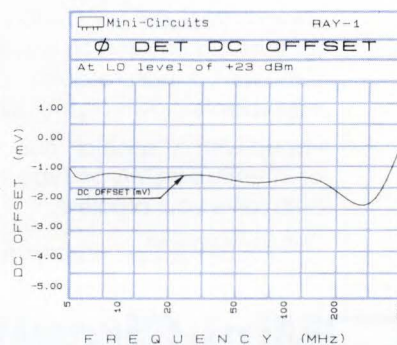
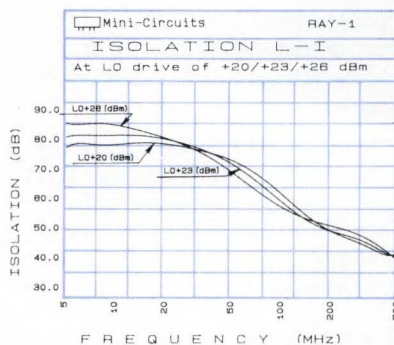
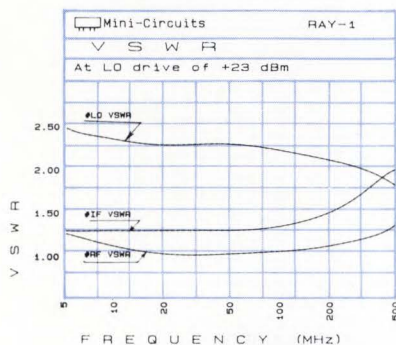
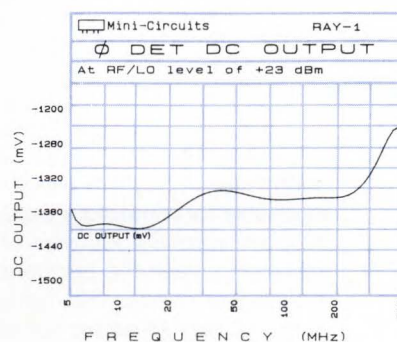
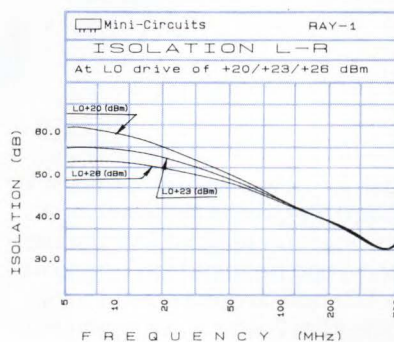
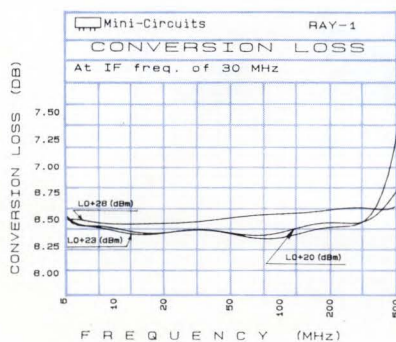
RF ORDER HARMONIC	RF CAL												
	0	-	-	13	20	24	27	21	35	19	40	26	51
	1	-	19	-	36	11	40	17	46	21	42	31	40
	2	83	60	50	62	51	60	52	59	53	59	52	67
	3	>85	72	62	68	60	69	58	71	55	72	54	76
	4	>85	>78	73	>78	76	>78	>78	>77	>78	>79	>78	>78
	5	>85	>78	>79	>79	>79	>78	>78	>78	77	>78	75	>79
	6	>85	>77	>79	>78	>79	>79	>78	>78	>78	>79	>79	>80
	7	>84	>78	>77	>79	>78	>78	>78	>79	>78	>78	>79	>79
	8	>86	>78	>79	>78	>78	79	>78	>79	>79	>79	>78	>78
	9	>86	>78	>77	>78	>78	>78	>79	>78	>80	>80	>78	>79
	10	>85	>79	>78	>77	>77	>78	>77	>79	>78	>79	>78	>79
		0	1	2	3	4	5	6	7	8	9	10	

Harmonic LO Order

test conditions: RF = IN: FREQ. 185.1 MHZ DRIVE 0 DBM
 TESTED ON: 17.10.84
 LO = IN: FREQ. 155.01 MHZ DRIVE +22.97 DBM TESTED BY: D.E.
 IF = MEASURED: FREQ. 30.09 AMP. -6.82 DBM

typical performance curves

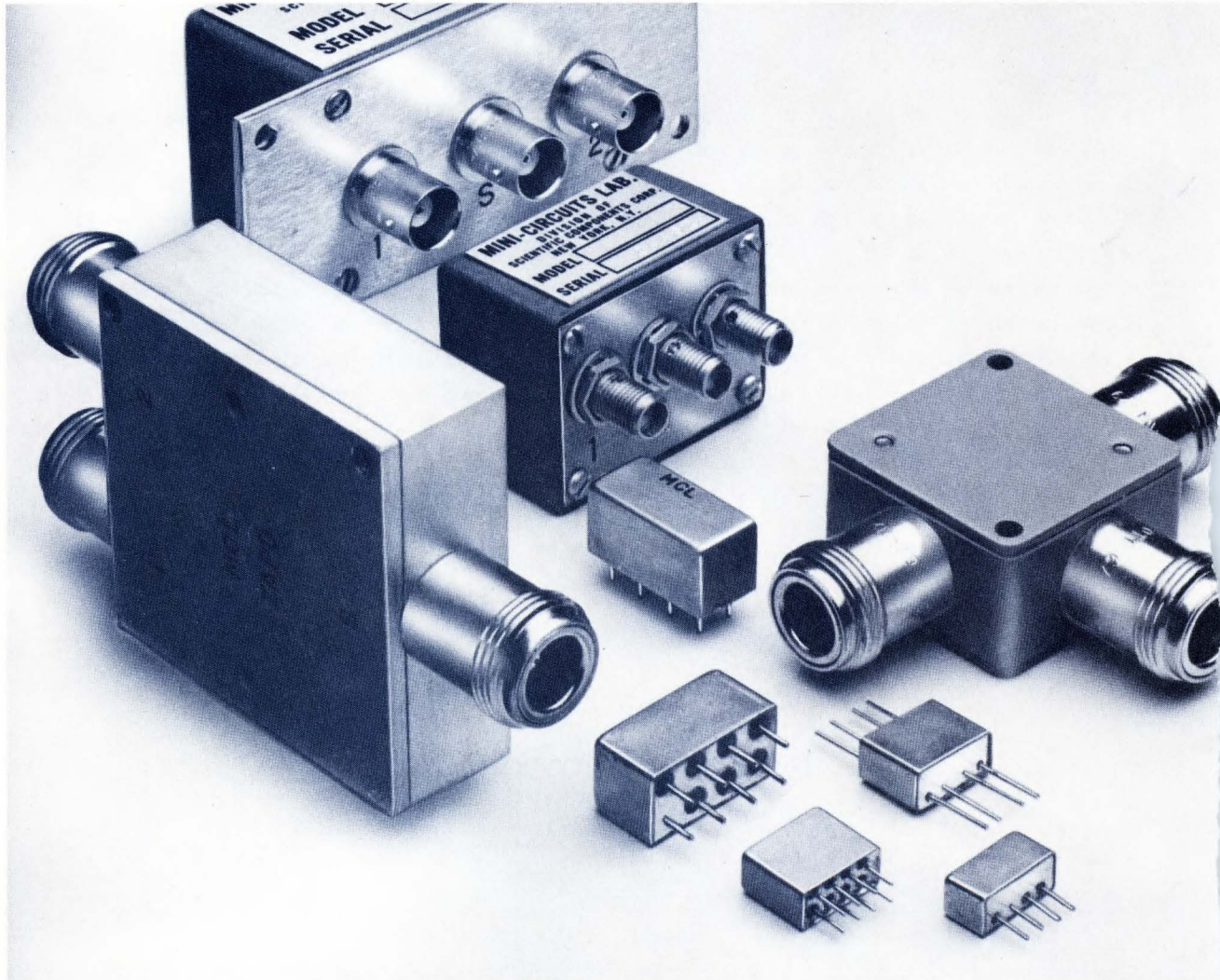
(production unit)



high isolation, wide bandwidth

Power Splitter/Combiners

2 to 48 Way . . . 0°, 90°, 180°
2KHz to 4.2GHz



With over 200 off-the-shelf models of power splitter/combiners available for immediate delivery from Mini-Circuits, there is no need to compromise your requirements. You can select a Mini-Circuits device to meet the frequency range and performance criteria of your system design. Pin models for PC- boards and connector versions (50 and 75 ohms) are available from 2-way 0°, 90° and 180° to 48-way covering 2KHz to 4.2GHz. Need detailed data for your design? Request our CAPD (computer-aided performance data) for specifics on insertion loss, isolation, amplitude unbalance and return loss. For high reliability, check the listings of MIL-P-23971/15* equivalents shown on the data pages.

Faced with a "special" need . . . higher isolation, wide bandwidth, or intermixed SMA or Type N connectors? Just contact us. We'll help solve your problem.

*Units are not GPL listed.

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getting tighter specs at lower costs

Basically, a 0° splitter is a passive device which accepts an input signal and delivers multiple output signals with specific phase and amplitude characteristics, see Fig. 1. The output signals theoretically possesses the following characteristics:

- equal amplitude
- 0° phase relationship between any two output ports
- insertion loss as follows:

No. of Output Ports	Theoretical Insertion Loss (dB)
2	3.0
3	4.8
4	6.0
6	7.8
8	9.0
16	12.0
24	13.8

A 0° power splitter can be used as a power combiner by applying the signals to be combined into the ports A and B and then delivering the vector sum to port S. Now the device provides a single output equal to the vector sum of the inputs reduced in power by the theoretical insertion loss. An important characteristic of a power combiner is the high isolation between inputs.

The following signal processing functions can be accomplished by power splitter/combiners:

1. Add or subtract signal vectorially.
2. Obtain multi in-phase output signals proportional to the level of a common input signal.
3. Split an input signal into multi-outputs.
4. Combine signals from different sources to obtain a single port output.
5. Provide a capability to obtain RF logic arrangements.

match the specs to the application

Generally, engineering designs exist in a world of tradeoffs. Mixers, for example, can be designed so that isolation can be improved at the expense of conversion loss; similarly, a mixer's noise figure can be improved if a reduction in dynamic range can be accepted in exchange.

Not so, fortunately with power splitters. The key parameters are influenced in the same direction during the design stage. A well-designed power splitter will offer high isolation low insertion loss and good VSWR. You just don't encounter a power splitter with high isolation and poor VSWR, nor high isolation with a poor insertion loss spec. Why? Because poor insertion loss specs generally result from an improper matching transformer (winding not exactly symmetrical) or slight variations in stray capacitances at each end of the transformer; these effects, however, adversely affect isolation loss as well as isolation.



1. When used as a 0° power splitter

the input is applied to port S and equal outputs appear at ports A and B. When used as a power combiner, both inputs are applied to ports A and B and the sum taken from port S.

(END minipg69)

This raises a significant point. There is no need to specify a number of tight spec parameters when you need a power splitter for a particularly stringent requirement. Simply specify a tight improved spec on the key parameter most critical to the task and you'll find the remaining specs will also be upgraded. If you insist on writing tight specs on a number of parameters, you may be paying extra money for a device you would have received anyway. Of course, you can specify one tight parameter, as suggested, and request support data on the other parameters to monitor their characteristics.

In some applications, it is possible for several parameters to be important. In other applications, only one parameter may be considerably significant while others are not. For example, in a power combiner used to add the outputs of two amplifiers, insertion loss is a critical factor while isolation may not be deemed critical.

On the other hand, consider a test setup for two-tone, third-order IM measurement. Here it is common to operate two RF generators that are close to each other in frequency, resulting in one generator "talking to the other" or "pulling". To avoid this measurement pitfall, a power splitter is placed between both RF generators; here the isolation spec is very significant while other parameters, such as phase of amplitude unbalance, have no importance at all.

Again, you can lower your demands, and your cost, by analyzing what parameters must be met while understanding others that can be ignored.



Don't guess, use CAPD data

Don't gamble with your systems design. Refer to the computer-automated performance data (CAPD) within the Mini-Circuits pages of this directory. Need CAPD data at the specific frequencies your application involves? Just phone or write us.

Power Splitter/Combiners

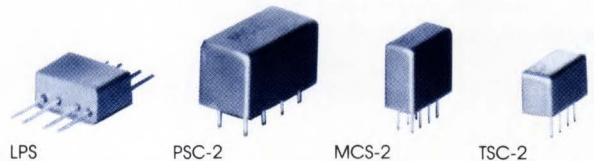
2 WAY-O°
2 KHz to 4.2 GHz

performance data

curves, tables, page 4 Model Index

case style selection

outline drawings see page 3



	MODEL NO.	FREQ. RANGE MHz f_L - f_U	ISOLATION dB						INSERTION LOSS, dB Above 3dB						PHASE UNBALANCE Degrees			AMPLITUDE UNBALANCE dB			PRICE, \$		
			L		M		U		L		M		U		L	M	U	L	M	U	Ea.	Qty.	
			Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Max.	Typ.	Max.	Typ.	Max.	Max.	Max.	Max.	Max.	Max.	Max.			
LPS case BB48	LPS-109	NEW	10-500	35	25	30	25	30	25	0.3	0.5	0.4	0.6	0.5	0.8	2.0	3.0	2.0	0.15	0.2	0.3	15.95	(5-24)
PSC-2 case A01	PSC-2-1		0.1-400	20	15	25	20	25	20	0.2	0.6	0.4	0.75	0.6	1.0	2.0	3.0	4.0	0.15	0.2	0.3	9.95	(6-49)
	PSC-2-1W		1-650	25	20	35	25	25	20	0.3	0.6	0.5	0.9	0.7	1.0	2.0	3.0	4.0	0.15	0.2	0.3	14.95	(6-49)
	PSC-2-2		0.002-60	27	20	30	20	27	20	0.3	0.6	0.3	0.6	0.6	1.0	2.0	3.0	4.0	0.15	.25	0.3	19.95	(6-49)
	PSC-2-4		10-1000	30	25	25	20	25	20	0.6	1.0	0.6	1.2	0.7	1.2	2.0	8.0	20	0.15	0.2	0.4	19.95	(6-49)
	■ PSC-2375		55-85	—	—	35	25	—	—	—	—	0.3	0.5	—	—	—	1.0	—	—	0.1	—	19.95	(6-24)
	■ PSC-2-1-75		0.25-300	20	15	30	20	20	15	0.4	0.75	0.4	0.75	0.4	1.0	2.0	3.0	5.0	0.15	0.2	0.3	11.95	(6-49)
MSC-2 case A03	MSC-2-1		0.1-450	20	15	30	20	30	20	0.3	0.5	0.4	0.75	0.6	1.0	2.0	3.0	4.0	0.15	0.2	0.3	16.95	(5-24)
	MSC-2-1W		2-650	22	18	30	25	22	18	0.3	0.5	0.5	0.8	0.8	1.2	1.0	2.0	4.0	0.15	0.2	0.3	17.95	(5-24)
TSC-2 case B02	TSC-2-1	NEW	1-400	30	25	30	25	30	20	0.25	0.5	0.4	0.75	0.8	1.0	2.0	3.0	4.0	0.15	0.2	0.6	13.95	(5-24)

L = low range (f_L to $10 f_L$)

M = mid range ($10 f_L$ to $f_U/2$)

U = upper range ($f_U/2$ to f_U)



computer-automated performance data

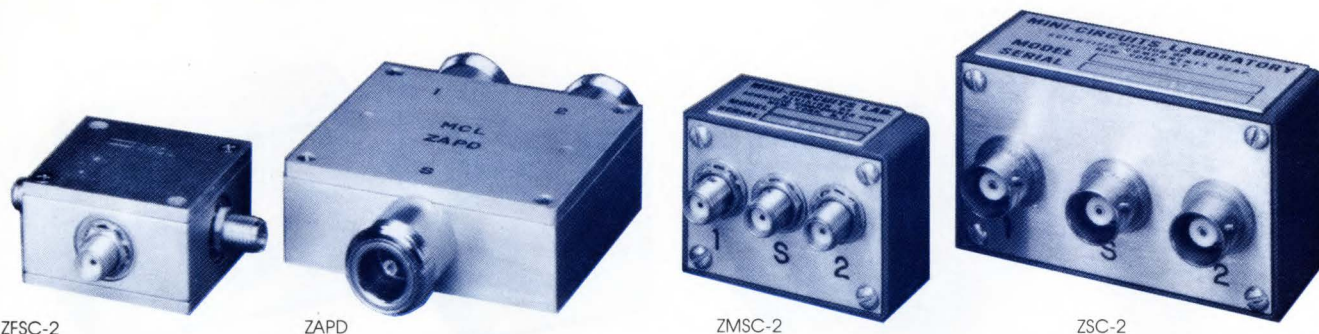
typical production unit / for data of other models consult factory

PSC-2-1

FREQUENCY MHz	INSERTION LOSS (dB)		UNBALANCE (dB)	ISOLATION (dB)	VSWR		
	S-1	S-2			SUM	1	2
10	3.33	3.33	.02	21.96	1.40	1.14	1.14
21.147	3.19	3.19	0.00	33.40	1.12	1.11	1.12
42.194	3.19	3.19	0.00	34.63	1.13	1.11	1.11
63.241	3.27	3.25	-.02	33.73	1.13	1.11	1.11
84.288	3.24	3.25	.01	32.70	1.13	1.11	1.11
105.335	3.27	3.27	.00	31.70	1.13	1.11	1.10
126.382	3.27	3.27	0.00	31.06	1.13	1.11	1.11
147.429	3.29	3.29	0.00	30.47	1.13	1.11	1.11
168.476	3.29	3.29	0.00	30.05	1.14	1.11	1.11
189.523	3.32	3.32	0.00	29.71	1.15	1.12	1.12
210.570	3.34	3.34	0.00	29.42	1.16	1.14	1.14
231.617	3.36	3.37	.01	29.18	1.18	1.15	1.15
252.664	3.37	3.41	.04	28.85	1.21	1.17	1.17
273.711	3.43	3.47	.04	28.53	1.25	1.20	1.20
294.758	3.45	3.45	0.00	27.90	1.30	1.23	1.23
315.805	3.47	3.49	.02	27.03	1.34	1.26	1.26
336.852	3.48	3.50	.03	25.92	1.40	1.29	1.29
357.899	3.50	3.56	.06	24.51	1.46	1.32	1.33
378.946	3.58	3.62	.06	22.93	1.54	1.36	1.37
400.000	3.70	3.74	.04	21.19	1.63	1.40	1.41

 **Mini-Circuits**

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ZFSC-2

ZAPD

ZMSC-2

ZSC-2

MODEL NO.		FREQ. RANGE MHz f_L - f_U	ISOLATION dB						INSERTION LOSS, dB Above 3dB						PHASE UNBALANCE Degrees			AMPLITUDE UNBALANCE dB			PRICE, \$	
			L Typ. Min.		M Typ. Min.		U Typ. Min.		L Typ. Max.		M Typ. Max.		U Typ. Max.		L Max.	M Max.	U Max.	L Max.	M Max.	U Max.	Ea.	Qty.
ZFSC-2 case K18	ZFSC-2-1	5-500	30	25	28	20	25	20	0.2	0.5	0.3	0.6	0.6	0.8	2.0	4.0	4.0	.15	.15	0.3	31.95	(4-24)
	ZFSC-2-1-75	0.25-300	20	15	30	20	20	15	0.4	0.75	0.4	0.75	0.4	1.0	2.0	3.0	5.0	.15	0.2	0.3	32.95	(4-24)
	ZFSC-2-1W	1-750	30	20	28	20	25	20	0.2	0.5	0.4	0.8	0.8	1.0	2.0	4.0	4.0	.15	.15	0.3	35.95	(4-24)
	ZFSC-2-2	10-1000	30	20	25	20	23	18	0.2	0.5	0.5	1.0	0.9	1.2	2.0	4.0	4.0	.15	.15	0.3	39.95	(4-24)
	ZFSC-2-4	0.2-1000	20	15	25	20	23	18	0.2	0.5	0.5	1.0	0.9	1.2	2.0	4.0	4.0	.15	.15	0.3	44.95	(4-24)
	ZFSC-2-5	10-1500	25	15	30	20	25	18	0.25	0.6	0.5	1.0	0.8	1.5	5.0	8.0	10.0	.15	0.2	0.5	49.95	(4-24)
	ZFSC-2-6	0.002-60	27	20	30	20	27	20	0.3	0.6	0.3	0.6	0.6	1.0	2.0	3.0	4.0	.15	0.2	0.3	36.95	(4-24)
	ZFSC-2-6-75	0.004-60	30	20	35	20	25	20	0.5	0.8	0.4	0.8	0.7	1.0	1.0	2.0	3.0	.15	0.2	0.3	38.95	(4-24)
ZAPD case F14	ZAPD-1	0.5-1.0	25	19	25	19	25	19	0.25	0.6	0.25	0.6	0.25	0.6	—	1	—	—	0.2	—	39.95	(1-9)
	ZAPD-2	1.0-2.0	25	19	25	19	25	19	0.25	0.6	0.25	0.6	0.25	0.6	—	2	—	—	0.2	—	39.95	(1-9)
	ZAPD-4	2.0-4.2	25	19	25	19	25	19	0.4	0.8	0.4	0.8	0.4	0.8	—	6	—	—	0.4	—	39.95	(1-9)
	ZAPD-21	0.5-2.0	25	19	25	19	25	19	0.25	0.8	0.25	0.8	0.25	0.8	—	2	—	—	0.2	—	49.95	(1-9)
ZMSC-2 case M21	ZMSC-2-1	0.1-400	20	15	25	20	25	20	0.2	0.5	0.4	0.75	0.6	1.0	2.0	3.0	4.0	.15	0.2	0.3	37.95	(4-24)
	ZMSC-2-1W	1-650	25	20	35	25	25	20	0.3	0.5	0.5	0.8	0.7	1.0	2.0	3.0	4.0	.15	0.2	0.3	42.95	(4-24)
	ZMSC-2-2	0.002-60	27	20	30	20	27	20	0.3	0.6	0.3	0.6	0.6	1.0	2.0	3.0	4.0	.15	.25	0.3	47.95	(4-24)
ZSC-2 case M22	ZSC-2-1	0.1-400	20	15	25	20	25	20	0.2	0.5	0.4	0.75	0.6	1.0	2.0	3.0	4.0	.15	0.2	0.3	27.95	(4-24)
	ZSC-2-1W	1-650	25	20	35	25	25	20	0.3	0.5	0.5	0.8	0.7	1.0	2.0	3.0	4.0	.15	0.2	0.3	32.95	(4-24)
	ZSC-2-2	0.002-60	25	20	30	20	27	20	0.3	0.6	0.3	0.6	0.6	1.0	2.0	3.0	4.0	.15	.25	0.3	37.95	(4-24)
	ZSC-2-4	10-1000	25	20	35	20	25	20	0.2	0.5	0.5	0.8	0.7	1.3	2.0	4.0	6.0	.15	0.2	0.3	37.95	(4-24)
	ZSC-2375	55-85	35	25	35	25	35	25	0.3	0.5	0.3	0.5	0.3	0.5	—	1.0	—	—	0.1	—	37.95	(4-24)
	ZSC-2-1-75	0.25-300	20	15	30	20	20	15	0.4	0.75	0.4	0.75	0.4	1.0	2.0	3.0	5.0	.15	0.2	0.3	29.95	(4-24)

L = low range (f_L to $10 f_L$)M = mid range ($10 f_L$ to $f_U/2$)U = upper range ($f_U/2$ to f_U)**NOTES:**

■ Denotes 75 ohm models, 75 ohm BNC connectors are standard.

1. For Quality Control procedures, see page 6.
2. For environmental specifications, see page 7.
3. Absolute Maximum Ratings, Matched power rating ZAPD 10W
all other models 1W, Internal load dissipation 0.125W, see page 6.
4. For connector types and case mounting options, see case style outline drawing.
5. Prices and specifications subject to change without notice.

pin and coaxial connections

see case style outline drawing

Series	Sum Port	Port 1	Port 2	Ground
LPS	1	4	5	2,3,6,7,8
PSC-2	1	5	6	2,3,4,7,8
MSC-2	1	5	6	2,3,4,7,8
TSC-2	1	2	4	3
ZFS-2	3	1	2	—
ZAPD-2	3	1	2	—
ZMSC-2	2	1	3	—
ZSC-2	2	1	3	—

MIL-P-23971/15, NSN GUIDE

MCL NO.	NSN	MIL-P-23971/15*
MSC-2-1	6625-01-124-8595	02
PSC-2-1	5820-00-548-0739	01
PSC-2-2	5825-01-044-8944	
ZFSC-2-2A	6625-01-079-7021	
ZMSC-2-1W	5895-01-127-0232	
ZSC-2-1BNC	5895-01-036-6254	
ZSC-2-1B	5820-00-270-3055	
ZSC-2-1B-TNC	5820-01-109-3706	
ZSC-2-2-75B	5915-01-012-8162	

*units are not QPL listed

In Stock... Immediate Delivery

Power Splitter/Combiners

2 WAY-90°

1.4 MHz to 4.2 GHz
performance data

curves, tables, page 4 Model Index

case style selection

outline drawings see page 3



MODEL NO.	FREQ RANGE MHz	ISOLATION dB		INSERTION LOSS dB Avg. of Coupled Outputs less 3 dB		PHASE UNBALANCE Degrees Max.	AMPLITUDE UNBALANCE dB Max.	PRICE \$	
		Typ.	Min.	Typ.	Max.			Ea.	Qty.
PSCQ-2 case A01	PSCQ-2-1.5	1.4-1.7	29	25	0.4	0.7	3.0	1.2	12.95 (5-49)
	PSCQ-2-3.4	3.0-3.8	30	25	0.4	0.7	3.8	1.2	16.95 (5-49)
	PSCQ-2-6.4	5.8-7.0	30	25	0.4	0.7	3.0	1.2	12.95 (5-49)
	PSCQ-2-7.5	7.0-8.0	35	25	0.4	0.7	3.0	1.2	12.95 (5-49)
	PSCQ-2-10.5	9.0-11.0	25	20	0.4	0.7	3.0	1.2	12.95 (5-49)
	PSCQ-2-13	12-14	29	25	0.4	0.7	3.0	1.2	12.95 (5-49)
	PSCQ-2-14	12-16	30	25	0.3	0.6	3.0	1.8	16.95 (5-49)
	PSCQ-2-21.4 NEW	20-23	30	25	0.4	0.7	3.0	1.2	12.95 (5-49)
	PSCQ-2-50	25-50	30	20	0.3	0.7	3.0	1.5	19.95 (5-49)
	PSCQ-2-70 NEW	40-70	30	20	0.3	0.7	3.0	1.5	19.95 (5-49)
	PSCQ-2-90	55-90	30	20	0.3	0.7	3.0	1.2	19.95 (5-49)
	PSCQ-2-120 NEW	80-120	25	18	0.3	0.7	3.0	1.5	19.95 (5-49)
	PSCQ-2-180	120-180	23	15	0.3	0.7	4.0	1.2	19.95 (5-49)
	PSCQ-2-250 NEW	150-250	25	18	0.4	0.8	4.0	1.5	19.95 (5-49)
ZAPDQ case F14	ZAPDQ-2	1000-2000	22	16	0.4	0.9	5.0	1.0	59.95 (1-9)
	ZAPDQ-4	2000-4200	22	16	0.4	0.9	5.0	1.0	59.95 (1-9)
ZMSCQ-2 case M21	ZMSCQ-2-50	25-50	30	20	0.3	0.7	3.0	1.5	49.95 (4-24)
	ZMSCQ-2-90	55-90	30	20	0.3	0.7	3.0	1.2	49.95 (4-24)
	ZMSCQ-2-180	120-180	23	15	0.3	0.7	4.0	1.2	49.95 (4-24)
ZSCQ-2 case M22	ZSCQ-2-50	25-50	30	20	0.3	0.7	3.0	1.5	39.95 (4-24)
	ZSCQ-2-90	55-90	30	20	0.3	0.7	3.0	1.2	39.95 (4-24)
	ZSCQ-2-180	120-180	23	15	0.3	0.7	4.0	1.2	39.95 (4-24)

NOTES:

1. For Quality Control procedures, see page 6.
2. For environmental specifications see page 7.
3. Absolute Maximum Ratings.
Matched power rating ZAPDQ(10W),
all other models (1W).
Internal load dissipation (0.125W), see page 7.
4. For connector types and case mounting options,
see case style outline drawings.
5. Prices and specifications
subject to change without notice.

pin and coaxial connections

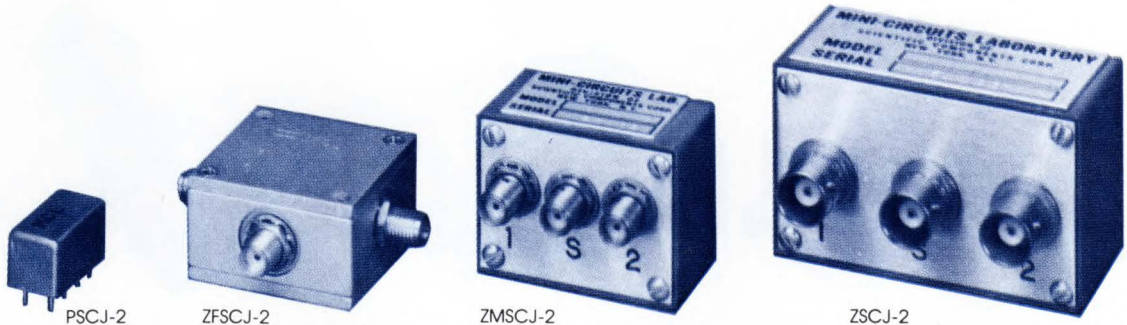
see case style outline drawing

Series	Sum Port	Port 1	Port 2	Ground	Terminate 50 ohms
PSCQ-2	1	2	5	3,4,7,8	6
PSCJ-2	1	5	6	2,3,4,7,8	—
ZAPDQ	3	1	2	—	—
ZMSCQ-2	2	1	3	—	—
ZSCQ-2	2	1	3	—	—
ZFSCJ-2	3	1	2	—	—
ZMSCJ-2	2	1	3	—	—
ZSCJ-2	2	1	3	—	—

50 ohms

Mini-Circuits

2 WAY-180°
10 KHz to 500 MHz



MODEL NO.	FREQ. RANGE MHz f_L - f_U	ISOLATION dB						INSERTION LOSS, dB Above 3dB						PHASE UNBALANCE Degrees			AMPLITUDE UNBALANCE dB			PRICE, \$	
		L		M		U		L		M		U		L		M		U		Ea.	Qty.
		Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Max.	Typ.	Max.	Typ.	Max.	Max.	Max.	Max.	Max.	Max.	Max.		
PSCJ-2 case A01	PSCJ-2-1 PSCJ-2-2	1-200 0.01-20	35 35	30 25	35 30	25 25	30 18	.75 0.3	1.0 0.8	0.5 0.2	0.8 0.5	.75 0.3	1.2 0.6	2.0 1.0	2.5 2.0	4.0 2.5	.15 0.1	.15 0.1	0.3 0.2	19.95 29.95	(5-49) (5-49)
ZFSCJ-2 case K18	ZFSCJ-2-1 ZFSCJ-2-3	1-500 5-300	30 30	20 20	33 33	25 25	30 18	1.0 1.0	1.5 1.5	1.0 1.0	1.5 1.5	1.0 1.0	1.5 1.5	2.0 2.0	4.0 4.0	6.0 6.0	.15 .15	0.2 0.2	0.5 0.5	49.95 39.95	(4-24) (4-24)
ZMSCJ-2 case M21	ZMSCJ-2-1 ZMSCJ-2-2	1-200 0.01-20	35 35	30 25	35 30	25 25	30 18	.75 0.3	1.0 0.8	0.6 0.2	0.8 0.5	.75 0.3	1.2 0.6	2.0 1.0	2.5 2.0	4.0 2.5	.15 0.1	.15 0.1	0.3 0.2	47.95 57.95	(4-24) (4-24)
ZSCJ-2 case M22	ZSCJ-2-1 ZSCJ-2-2	1-200 0.01-20	35 35	30 25	35 30	25 25	30 18	.75 0.3	1.0 0.8	0.6 0.2	0.8 0.5	.75 0.3	1.2 0.6	2.0 1.0	2.5 2.0	4.0 2.5	.15 0.1	.15 0.1	0.3 0.2	37.95 47.95	(4-24) (4-24)

L = low range (f_L to 10 f_L) M = mid range (10 f_L to $f_U/2$) U = upper range ($f_U/2$ to f_U)



computer-automated performance data
typical production unit / for data of other models consult factory

PSCJ-2-1	FREQUENCY MHz	INSERTION LOSS (dB)		UNBAL. (dB)	ISOLATION (dB)	VSWR		
		S-1	S-2			Sum	1	2
				1-2	1-2			
	1.20	3.79	3.64	.15	30.98	1.06	1.15	1.15
	11.473	3.60	3.44	.16	32.77	1.04	1.19	1.19
	21.946	3.56	3.47	.09	33.61	1.06	1.20	1.20
	32.419	3.60	3.51	.09	34.38	1.08	1.21	1.22
	42.892	3.61	3.52	.09	35.06	1.10	1.22	1.24
	53.365	3.72	3.53	.19	35.92	1.11	1.24	1.25
	63.838	3.64	3.53	.11	36.93	1.13	1.25	1.27
	74.311	3.79	3.58	.21	38.25	1.15	1.26	1.29
	84.784	3.77	3.57	.20	39.86	1.17	1.28	1.31
	95.257	3.82	3.62	.20	41.94	1.19	1.29	1.33
	105.73	3.88	3.65	.23	45.24	1.22	1.31	1.36
	116.203	3.83	3.66	.17	48.23	1.24	1.33	1.38
	126.676	3.92	3.66	.26	48.12	1.27	1.34	1.41
	137.149	3.92	3.65	.27	44.90	1.29	1.36	1.43
	147.622	3.96	3.65	.31	40.93	1.31	1.38	1.46
	158.395	4.02	3.69	.33	39.29	1.34	1.40	1.50
	168.568	3.97	3.68	.29	35.97	1.36	1.42	1.53
	179.041	4.08	3.66	.42	34.09	1.39	1.45	1.56
	189.514	4.09	3.68	.41	32.50	1.42	1.47	1.60
	200.00	4.03	3.65	.38	30.89	1.44	1.49	1.64

In Stock... Immediate Delivery

Power Splitter/Combiners

3 WAY-O°

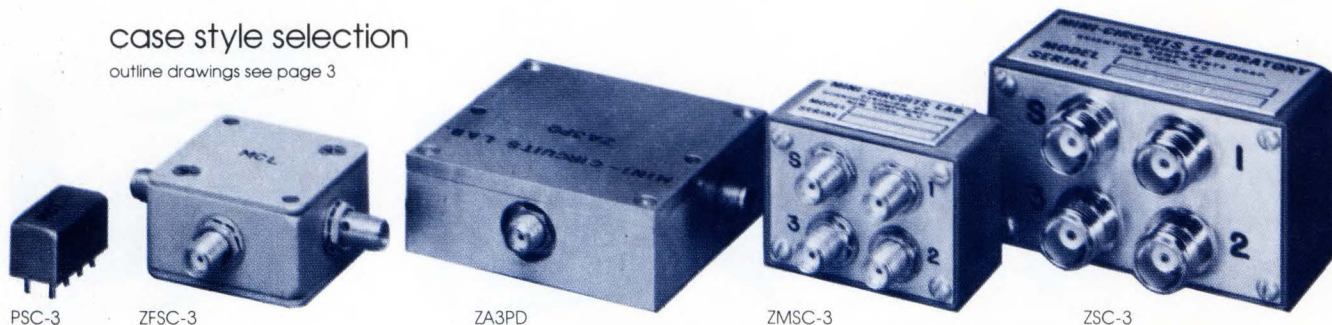
10 KHz to 4.2 GHz

performance data

curves, tables, page 4 Model Index

case style selection

outline drawings see page 3



PSC-3

ZFSC-3

ZA3PD

ZMSC-3

ZSC-3

MODEL NO.	FREQ. RANGE MHz f_L - f_U	ISOLATION dB						INSERTION LOSS, dB Above 4.8dB						PHASE UNBALANCE Degrees			AMPLITUDE UNBALANCE dB			PRICE, \$	
		L		M		U		L		M		U		L		M		U		Ea.	Qty.
		Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Max.	Typ.	Max.	Typ.	Max.	Max.	Max.	Max.	Max.	Max.	Max.		
PSC-3 case A01	• PSC-3-1 • PSC-3-1W • PSC-3-2 • PSC-3-1-75 - NEW PSC-3-1-75-2 • PSC-3-13	1-200 5-500 0.01-30 1-200 10-300 1-200	45 25 35 35 28 45	30 20 30 30 20 35	40 31 40 35 25 45	25 15 30 25 20 30	25 15 25 25 20 30	0.6 0.4 .25 0.6 0.2 .25	1.0 0.8 .45 1.0 0.4 0.5	0.4 0.4 .15 0.3 0.3 .35	0.7 1.4 0.3 0.7 0.5 0.6	0.6 0.8 .45 0.6 0.4 0.6	1.0 1.4 .75 1.0 0.7 0.6	1.0 6.0 1.0 2.0 2.0 1.0	2.0 14. 2.0 3.0 3.0 3.0	4.0 20. 4.0 4.0 4.0 4.0	.15 0.1 0.2 .15 .15 0.1	0.2 0.3 0.3 0.2 0.2 0.2	0.3 0.6 0.4 0.3 0.3 0.2	19.95 29.95 29.95 20.95 22.95 24.95	(5-49) (5-49) (5-49) (5-49) (5-49) (5-49)
ZFSC-3 case J17	• ZFSC-3-1 • ZFSC-3-1W • ZFSC-3-13	1-500 2-750 1-200	30 30 45	20 20 30	30 20 48	20 25 35	18 18 30	0.4 0.4 .25	.75 .75 0.5	0.5 1.0 .35	0.9 1.0 0.6	0.8 1.0 .35	1.2 1.6 0.6	2.0 3.0 1.0	3.0 5.0 3.0	4.0 7.0 5.0	0.2 0.2 0.1	0.3 0.3 0.2	0.4 0.5 0.2	39.95 41.95 39.95	(4-24) (4-24) (4-24)
ZA3PD case CC51	• ZA3PD-1 NEW • ZA3PD-1.5 NEW • ZA3PD-2 NEW • ZA3PD-4 NEW	0.5-1.0 0.75-1.5 1-2 2-4.2	20 20 20 18	15 16 18 14	20 20 20 18	15 16 18 14	18 16 18 14	0.3 0.3 0.3 0.7	0.6 0.7 0.6 1.0	0.3 0.3 0.3 0.7	0.6 0.7 0.6 1.0	0.3 0.3 0.3 0.7	0.6 0.7 0.6 1.0	— — — —	— — — —	— — — —	0.4 0.3 0.3 0.8	0.4 0.3 0.3 0.8	0.4 0.3 0.3 0.8	79.95 79.95 79.95 79.95	(1-9) (1-9) (1-9) (1-9)
ZMSC-3 case P26	• ZMSC-3-1 • ZMSC-3-2	1-200 0.01-30	45 35	35 30	40 40	30 35	25 25	0.6 .25	1.0 .45	0.4 .15	0.7 0.3	0.6 .45	1.0 .75	1.0 1.0	2.0 2.0	4.0 4.0	.15 0.2	0.2 0.3	0.3 0.4	47.95 57.95	(4-24) (4-24)
ZSC-3 case P25	• ZSC-3-1 • ZSC-3-2 • ZSC-3-1-75 • ZSC-3-2-75	1-200 0.01-30 1-200 0.02-20	45 35 35 35	30 30 30 30	40 40 35 35	30 30 25 25	25 25 35 20	0.6 .25 0.6 0.2	1.0 .45 1.0 0.5	0.4 .15 0.4 .25	0.7 0.3 0.7 0.6	0.6 .45 0.6 .45	1.0 .75 1.0 .75	1.0 1.0 2.0 2.0	2.0 2.0 3.0 3.0	4.0 4.0 4.0 4.0	.15 0.2 .15 0.2	0.2 0.3 0.3 0.3	0.3 0.4 0.3 0.4	37.95 47.95 38.95 48.95	(4-24) (4-24) (4-24) (4-24)

L = low range (f_L to 10 f_L)

M = mid range (10 f_L to $f_U/2$)

U = upper range ($f_U/2$ to f_U)

MIL-P-23971/15, NSN GUIDE

MCL NO.	NSN
PSC-3-1	5820-01-015-6027
ZSC-3-1B	5820-01-008-9566
ZSC-3-2B	5825-01-120-9320
PSC-4-1	5821-01-065-0106
PSC-4-2	5825-01-044-8945
PSC-4-3	5825-01-105-6189
ZSC-4-1B	5820-00-270-3056
ZSC-4-2B	5820-01-120-5238
ZSC-4-3B	6920-01-038-8553

pin connections

see case style outline drawing

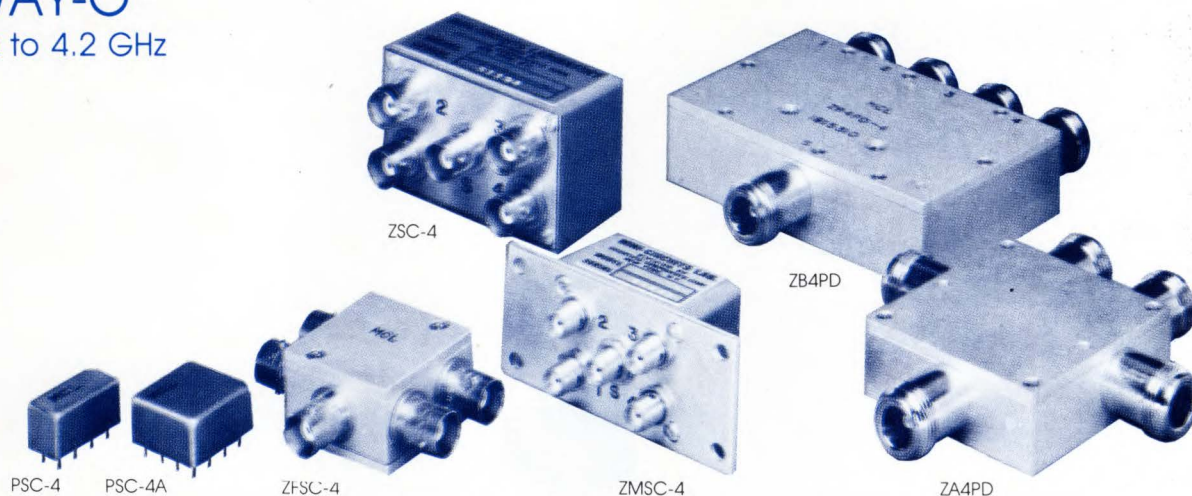
Series	Sum Port	Port 1	Port 2	Port 3	Port 4	Ground
PSC-3 except PSC-3-1W, PSC-3-1-75-2	6	1	2	5	—	3,4,7,8
PSC-3-1W PSC-3-1-75-2	1	5	7	8	—	2,3,4,6
PSC-4	4	7	8	1	2	3,5,6
PSC-4A	2	8	12	5	9	1,3,4,6,7,10 11,13,14,15,16

50 ohms and 75 ohms

Mini-Circuits

4 WAY-O°

2 KHz to 4.2 GHz



MODEL NO.	FREQ. RANGE MHz f_L - f_U	ISOLATION dB						INSERTION LOSS, dB Above 6dB						PHASE UNBALANCE Degrees			AMPLITUDE UNBALANCE dB			PRICE, \$	
		L		M		U		L		M		U		L		M		U		Ea.	Qty.
		Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Max.	Typ.	Max.	Typ.	Max.	Max.	Max.	Max.	Max.	Max.	Max.		
PSC-4 case A01	PSC-4-1 1-200	33	20	30	20	27	20	0.4	0.6	0.5	.75	0.7	1.0	4.0	6.0	8.0	.15	.20	.25	28.95	(6-49)
	PSC-4-1-75	30	20	25	20	25	20	0.4	0.7	0.5	0.9	0.7	1.2	4.0	6.0	10.0	.15	.20	0.3	24.95	(6-49)
	PSC-4-3	33	20	30	20	27	20	0.4	0.7	0.5	.75	0.7	1.2	4.0	6.0	8.0	.15	.20	.25	23.95	(6-49)
	PSC-4-6	35	29	32	25	25	18	0.4	0.8	0.3	0.5	0.5	1.0	4.0	6.0	8.0	.10	.15	.20	29.95	(6-49)
PSC-4A case C07	PSC-4A-4	25	20	21	15	18	15	0.5	0.8	0.8	1.1	1.5	2.5	4.0	16.0	20.0	.20	.30	.20	49.95	(6-49)
ZFSC-4 case G15	ZFSC-4-1	25	20	23	18	20	15	0.4	0.8	0.6	1.5	1.6	2.5	4.0	8.0	8.0	0.2	0.4	0.7	89.95	(1-4)
	ZFSC-4-1W	23	20	23	20	23	20	0.6	1.5	0.6	1.5	0.6	1.5	4.0	8.0	8.0	0.2	0.3	0.4	74.95	(1-4)
	ZFSC-4-3	32	28	38	30	38	30	0.5	0.8	0.6	0.9	0.9	1.2	4.0	6.0	8.0	0.1	0.1	0.2	69.95	(1-4)
	ZFSC-4375	34	30	34	30	34	30	0.3	0.8	0.3	0.8	0.3	0.8	4.0	6.0	8.0	0.15	0.15	0.15	89.95	(1-4)
	ZFSC-4-2-75-1	25	20	25	20	25	20	0.8	1.0	0.8	1.0	0.8	1.0	4.0	16.0	20.0	0.4	0.4	0.4	74.95	(1-4)
ZMSC-4 case N24	ZMSC-4-1	33	20	30	20	27	20	0.4	0.6	0.5	.75	0.7	1.0	4.0	6.0	1.0	.15	.20	.25	56.95	(4-24)
	ZMSC-4-2	30	20	33	25	33	25	.45	.75	0.3	0.5	0.7	1.0	4.0	6.0	8.0	.15	.20	.25	69.95	(4-24)
	ZMSC-4-3	33	20	30	20	27	20	0.4	0.7	0.5	.75	0.7	1.2	4.0	6.0	10.0	.15	.20	.25	53.95	(4-24)
ZSC-4 case N27	ZSC-4-1	33	20	30	20	27	20	0.4	0.6	0.5	.75	0.7	1.0	4.0	6.0	8.0	.15	.20	.25	46.95	(4-24)
	ZSC-4-1-75	30	20	25	20	25	20	0.4	0.7	0.5	0.8	0.7	1.2	4.0	6.0	10.0	.15	.20	0.3	46.95	(4-24)
	ZSC-4-2	30	20	33	25	33	25	.45	.75	0.3	0.5	0.7	1.0	4.0	6.0	8.0	.15	.20	.25	69.95	(4-24)
	ZSC-4-3	33	20	30	20	27	20	0.4	0.7	0.5	.75	0.7	1.2	4.0	6.0	10.0	.15	.20	.25	43.95	(4-24)
ZA4PD case DD52	ZA4PD-2	25	18	25	18	25	18	0.3	0.8	0.3	0.8	0.3	0.8	—	6.0	—	0.7	0.7	0.7	79.95	(1-9)
	ZA4PD-4	25	18	25	18	25	18	0.5	0.8	0.3	0.8	0.3	0.8	—	16.0	—	0.8	0.8	0.8	79.95	(1-9)
ZB4PD case EE54	ZB4PD-42	23	16	23	16	23	16	0.5	1.1	0.5	1.1	0.5	1.1	—	8.0	—	0.8	0.8	0.8	99.95	(1-9)
	ZB4PD-4	24	16	24	16	24	16	0.6	1.1	0.6	1.1	0.6	1.1	—	16.0	—	0.8	0.8	0.8	89.95	(1-9)

L = low range (f_L to 10 f_L)

M = mid range (10 f_L to $f_U/2$)

U = upper range ($f_U/2$ to f_U)

NOTES:

- Denotes 75 ohm models, 75 ohm BNC connectors are standard.
- Model PSC-3-1 manufactured under license protected by patent 3,428,920.
- ▲ On Model ZFSC-4-2-75-1, up to 15V and 15mA DC may be passed from input to all outputs.
- 1. For quality control procedures, see page 6.
- 2. For environmental specifications see page 7.
- 3. Absolute Maximum Ratings:
Matched power rating ZA3PD, ZA4PD, ZB4PD(10W)
all other models (1W)
Internal load dissipation
all 3-way models (0.375W) all 4-way models (0.25W), see page 7.
- 3. For connector types and case mounting options, see case style outline drawing.
- 4. Prices and specifications subject to change without notice.
- 5. All 3-way power dividers with exception of ZA3PD are licensed under U.S. Patent 3,428,920; reissued as RE 27,299.



In Stock... Immediate Delivery

Power Splitter/Combiners

5 WAY-O°

1 MHz to 300 MHz

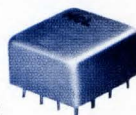
performance data

curves, tables, page 4 Model Index

case style selection

outline drawings see page 3

PSC-5



MODEL NO.	FREQ. RANGE MHz f_L - f_U	ISOLATION dB						INSERTION LOSS, dB Above 7.0dB						PHASE UNBALANCE Degrees			AMPLITUDE UNBALANCE dB			PRICE, \$	
		Typ.	L Min.	Typ.	M Min.	Typ.	U Min.	Typ.	L Max.	Typ.	M Max.	Typ.	U Max.	L Max.	M Max.	U Max.	L Max.	M Max.	U Max.	Ea.	Qty.
PSC-5-1 NEW	1-300	25	20	23	18	20	17	0.2	0.5	0.6	1.0	1.5	2.0	2.0	4.0	8.0	0.2	0.3	0.6	59.95	(1-5)
PSC-5-1-75 NEW	1-300	35	25	30	23	25	18	0.4	0.6	0.6	0.9	0.9	1.3	2.0	4.0	8.0	0.2	0.3	0.6	59.95	(1-5)

L = low range (f_L to $10 f_L$) M = mid range ($10 f_L$ to $f_U/2$) U = upper range ($f_U/2$ to f_U)

NOTES:

■ Denotes 75 ohm models, 75 ohm BNC connectors are standard.

1. Matched power rating, 1 watt
Internal load dissipation, 0.5 watt.
2. Refer to table of contents for quality control procedures, environmental specifications, and absolute maximum ratings.
3. For connector types, see case style outline drawing.
4. Prices and specifications subject to change without notice.

pin connections

see case style outline drawing

Series	Sum Port	Port 1	Port 2	Port 3	Port 4	Port 5	Port 6	Ground	Not Used
PSC-5	1	4	8	12	16	15	—	2,5,7,11,13,14	3,6,9,10
PSC-6	1	3	4	8	12	16	15	2,5,7,11,13,14	6,9,10

50 ohms and 75 ohms

Mini-Circuits

6 WAY-O°

1 MHz to 300 MHz



PSC-6

ZFSC-6

MODEL NO.		FREQ. RANGE MHz f_L - f_U	ISOLATION dB						INSERTION LOSS, dB Above 7.8dB						PHASE UNBALANCE Degrees			AMPLITUDE UNBALANCE dB			PRICE, \$	
			L		M		U		L		M		U		L	M	U	L	M	U	Ea.	Qty.
			Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Max.	Typ.	Max.	Typ.	Max.	Max.	Max.	Max.	Max.	Max.	Max.		
PSC-6 case C07	PSC-6-1	1-175	30	24	26	18	26	18	0.5	0.8	0.7	1.0	1.0	1.5	4.0	6.0	12.0	0.2	0.4	0.8	68.95	(1-5)
	PSC-6-1-75	1-300	35	25	30	23	25	18	0.4	0.6	0.6	0.9	0.6	1.1	2.0	6.0	12.0	0.2	0.3	0.6	78.95	(1-5)
ZFSC-6 case Q28	ZFSC-6-1	1-175	27	22	26	20	26	20	0.75	1.0	0.75	1.2	0.8	1.2	2.0	6.0	12.0	0.2	0.4	0.6	89.95	(1-4)
	ZFSC-6-1-75	1-200	30	25	30	22	20	18	0.75	1.0	0.75	1.0	0.9	1.2	2.0	6.0	12.0	0.2	0.4	0.6	89.95	(1-4)

L= low range (f_L to 10 f_L)

M= mid range (10 f_L to $f_U/2$)

U= upper range ($f_U/2$ to f_U)

PSC-6-1



computer-automated performance data
typical production unit / for data of other models consult factory

INSERTION LOSS	MHz	S-1 (dB)	S-2 (dB)	S-3 (dB)	S-4 (dB)	S-5 (dB)	S-6 (dB)	UNBAL
	1.00	8.39	8.40	8.42	8.43	8.45	8.43	0.06
	10.157	8.16	8.17	8.14	8.19	8.19	8.20	0.05
	28.471	8.24	8.24	8.23	8.27	8.27	8.29	0.04
	55.942	8.32	8.36	8.30	8.35	8.35	8.36	0.06
	83.413	8.39	8.43	8.38	8.42	8.46	8.43	0.08
	101.727	8.48	8.52	8.49	8.48	8.52	8.52	0.04
	120.041	8.62	8.62	8.55	8.58	8.62	8.63	0.07
	138.355	8.62	8.65	8.56	8.58	8.68	8.67	0.12
	156.669	8.68	8.72	8.60	8.65	8.75	8.72	0.15
	175.00	8.76	8.80	8.65	8.70	8.84	8.77	0.19

ISOLATION	MHz	1-2 (dB)	1-3 (dB)	1-5 (dB)	2-3 (dB)	4-5 (dB)	4-6 (dB)	5-6 (dB)
	1.00	30.19	31.52	40.69	28.79	29.26	31.97	27.69
	10.157	28.66	29.66	41.38	27.98	27.74	30.15	26.56
	28.471	28.10	29.10	40.68	27.35	26.92	29.51	26.09
	55.942	27.03	28.32	38.27	25.95	25.40	28.46	25.26
	83.413	25.99	27.54	36.33	24.53	23.90	27.41	24.34
	101.727	25.30	27.03	35.43	23.65	23.00	26.76	23.74
	120.041	24.71	26.59	34.81	22.91	22.22	26.24	23.22
	138.355	24.15	26.16	34.29	22.19	21.43	25.74	22.69
	156.669	23.57	25.72	34.02	21.43	20.75	25.27	22.17
	175.00	23.01	25.22	34.07	20.74	20.09	24.76	21.57

VSWR	MHz	#S VSWR	#1 VSWR	#2 VSWR	#3 VSWR	#4 VSWR	#5 VSWR	#6 VSWR
	1.00	1.12	1.11	1.10	1.10	1.11	1.09	1.10
	10.00	1.25	1.09	1.07	1.08	1.09	1.06	1.12
	27.36	1.26	1.08	1.07	1.08	1.08	1.04	1.11
	53.40	1.30	1.08	1.08	1.08	1.09	1.05	1.09
	88.12	1.37	1.08	1.09	1.09	1.09	1.05	1.11
	105.48	1.39	1.08	1.10	1.09	1.09	1.05	1.12
	122.84	1.40	1.08	1.11	1.10	1.10	1.05	1.13
	140.20	1.39	1.08	1.11	1.10	1.10	1.05	1.15
	157.56	1.37	1.08	1.12	1.11	1.11	1.05	1.15
	175.00	1.34	1.09	1.13	1.13	1.13	1.05	1.16

In Stock... Immediate Delivery

Power Splitter/Combiners

8 WAY-O°

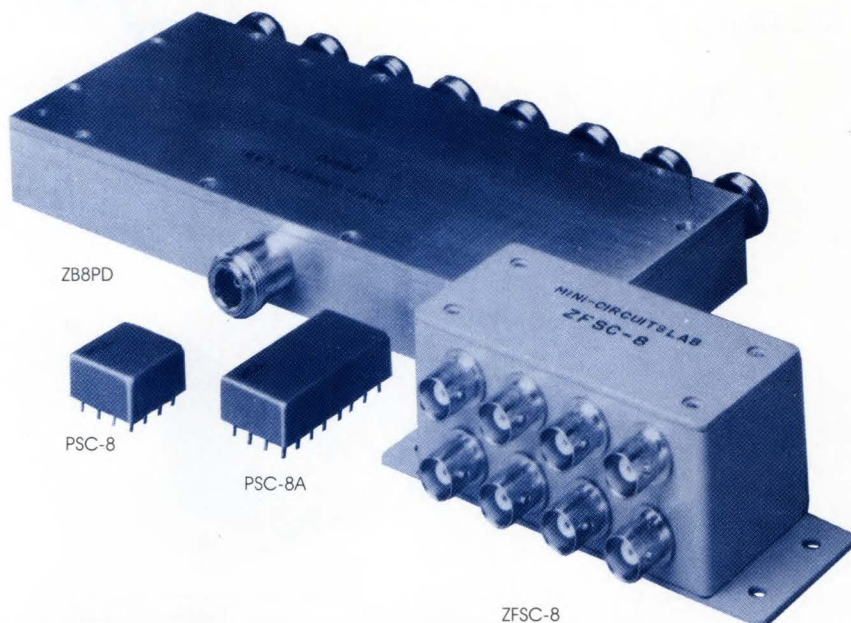
10 KHz to 4.2 GHz

performance data

curves, tables, page 4 Model Index

case style selection

outline drawings see page 3



MODEL NO.	FREQ. RANGE MHz f_L - f_U	ISOLATION dB						INSERTION LOSS, dB Above 9dB						PHASE UNBALANCE Degrees			AMPLITUDE UNBALANCE dB			PRICE, \$	
		L		M		U		L		M		U		L	M	U	L	M	U	Ea.	Qty.
		Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Max.	Typ.	Max.	Typ.	Max.	Max.	Max.	Max.	Max.	Max.			
PSC-8-1	0.5-175	30	25	30	20	25	18	0.8	1.2	0.8	1.2	1.0	1.6	1.0	2.5	5.0	0.2	0.2	0.3	68.95	(1-5)
PSC-8-1-75	0.5-175	25	20	30	20	25	20	0.5	1.0	0.6	1.1	0.7	1.3	1.0	2.5	5.0	0.2	0.2	0.3	69.95	(1-5)
PSC-8-6	0.01-10	40	30	40	25	28	23	0.3	0.7	0.5	1.0	0.6	1.1	1.0	2.5	4.0	0.1	0.2	0.3	79.95	(1-5)
PSC-8A-4	5-500	25	20	23	18	20	15	0.7	1.2	1.0	1.8	1.4	2.0	3.0	8.0	16.0	0.2	0.3	0.5	89.95	(1-4)
PSC-8A4-75	1-300	26	20	30	25	30	23	0.8	1.2	0.7	1.1	0.9	1.3	1.0	3.0	8.0	0.2	0.2	0.4	79.95	(1-4)
ZFSC-8-1	0.5-175	30	25	30	20	25	18	0.8	1.2	0.8	1.2	1.0	1.6	1.0	2.5	5.0	0.2	0.2	0.3	89.95	(1-4)
ZFSC-8-1-75	0.5-175	25	20	30	20	25	20	0.5	1.0	0.6	1.1	0.7	1.3	1.0	2.5	5.0	0.2	0.3	0.5	90.95	(1-4)
ZFSC-84-75	1-300	26	20	30	25	30	23	0.8	1.2	0.7	1.1	0.9	1.3	1.0	3.0	8.0	0.2	0.2	0.4	119.95	(1-4)
ZFSC-8375	50-90	30	30	30	25	25	25	1.0	1.0	1.0	1.3	1.3	1.3	2.0	2.0	2.00	0.2	0.2	0.2	119.95	(1-4)
ZFSC-8-4	5-700	35	25	25	20	20	17	0.8	1.2	1.2	1.8	1.8	2.5	2.0	5.0	15.0	0.2	0.4	0.7	129.95	(1-4)
ZFSC-8-43	30-1000	23	20	25	20	26	20	1.0	1.3	1.4	1.8	2.1	2.7	5.0	10.0	20.0	0.2	0.4	0.7	139.95	(1-4)
ZFSC-8-6	0.01-10	40	30	40	25	28	23	0.3	0.7	0.5	1.0	0.6	1.1	1.0	2.5	4.0	0.1	0.2	0.3	109.95	(1-4)
ZB8PD-2	1-2	24	16	24	16	24	16	0.8	1.3	0.8	1.3	0.8	1.3	1.3	1.3	1.3	0.7	0.7	0.7	149.00	(1-9)
ZB8PD-4	2-4.2	23	16	23	16	23	16	0.8	1.4	0.8	1.4	0.8	1.4	—	—	—	0.9	0.9	0.9	149.00	(1-9)
L = low range (f_L to $10 f_L$) M = mid range ($10 f_L$ to $f_U/2$) U = upper range ($f_U/2$ to f_U)																					

L = low range (f_L to 10 f_L)

M = mid range (10 f_L to $f_U/2$)

U = upper range ($f_U/2$ to f_U)

NOTES:

■ Denotes 75 ohm models, 75 ohm BNC connectors are standard.

1. Matched power rating, 1 watt.
internal load dissipation, 0.62 watts.
2. Refer to table of contents for quality control procedures,
environmental specifications, and absolute maximum ratings.
3. For connector types, see case style outline drawing.
4. Prices and specifications subject to change without notice.

pin connections

see case style outline drawing

Series	Sum Port	Port 1	Port 2	Port 3	Port 4	Port 5	Port 6	Port 7	Port 8	Ground	Not Used
PSC-8	2	1	5	9	13	16	12	8	4	3,6,7,14,15	10,11
PSC-8A	29	7	16	31	24	9	2	26	17	1,3,4,5,6,8,10,11, 12,13,14,15,18, 19,20,21,22,23,25, 27,28,30,32	

Mini-Circuits

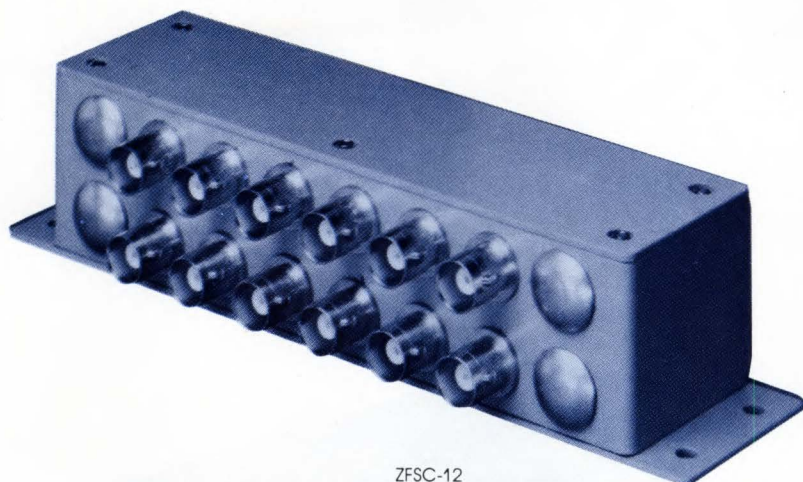
P.O. BOX 166, Brooklyn, New York 11235 (718) 934-4500

50 ohms and 75 ohms

Mini-Circuits

12 WAY-O°

1 MHz to 300 MHz



ZFSC-12

MODEL NO.	FREQ. RANGE MHz f_L - f_U	ISOLATION dB						INSERTION LOSS, dB Above 10.8dB						PHASE UNBALANCE Degrees			AMPLITUDE UNBALANCE dB			PRICE, \$	
		Typ.	L Min.	M Min.	U Min.	Typ.	Min.	Typ.	L Max.	M Max.	U Max.	Typ.	Max.	L Max.	M Max.	U Max.	L Max.	M Max.	U Max.	Ea.	Qty.
ZFSC-12-1	1-200	30	25	35	30	28	20	0.8	1.2	1.1	1.4	1.3	1.6	2.0	4.0	6.0	0.1	0.2	0.3	174.95	(1-4)
ZFSC-12-11	10-300	28	20	33	25	28	20	1.1	1.3	1.1	1.5	1.5	1.8	2.0	4.0	6.0	0.2	0.3	0.4	174.95	(1-4)

L = low range (f_L to $10 f_L$)

M = mid range ($10 f_L$ to $f_U/2$)

U = upper range ($f_U/2$ to f_U)



computer-automated performance data
typical production unit / for data of other models consult factory

PSC-8A-4

INSERTION LOSS, dB	MHz	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	UNBAL.
	5.00	9.60	9.60	9.60	9.62	9.62	9.62	9.59	9.60	.03
	31.05	9.66	9.68	9.68	9.67	9.65	9.67	9.65	9.67	.03
	57.11	9.78	9.80	9.81	9.80	9.79	9.77	9.77	9.78	.04
	109.21	10.00	10.01	10.02	10.02	9.96	9.96	9.96	9.97	.06
	161.32	10.35	10.36	10.36	10.36	10.27	10.27	10.26	10.29	.10
	213.42	10.54	10.53	10.55	10.54	10.42	10.41	10.42	10.43	.14
	265.53	10.72	10.69	10.72	10.70	10.56	10.55	10.57	10.59	.17
	317.63	10.78	10.75	10.79	10.77	10.62	10.61	10.64	10.67	.18
	395.79	10.79	10.76	10.79	10.79	10.63	10.60	10.65	10.68	.19
	500.00	10.86	10.85	10.89	10.90	10.77	10.71	10.78	10.81	.19
ISOLATION, dB	MHz	1-2	1-3	1-8	3-4	5-6	5-7	7-8		
	5.00	26.25	37.38	50.07	27.19	26.02	37.42	26.55		
	31.05	23.99	34.75	46.72	24.18	23.73	34.49	24.07		
	57.11	22.23	31.50	43.09	22.40	22.17	31.09	22.36		
	109.21	21.46	27.29	38.07	21.86	22.23	26.78	21.88		
	161.32	21.22	24.76	35.44	21.85	23.18	24.25	21.99		
	213.42	21.19	23.24	33.61	22.06	24.75	22.78	22.46		
	265.53	21.39	22.41	32.29	22.47	27.11	22.02	23.28		
	317.63	21.84	22.04	31.09	22.98	30.46	21.84	24.52		
	395.79	22.53	22.23	29.80	23.70	36.05	22.56	27.24		
	500.00	22.74	24.07	28.71	23.44	31.27	25.96	30.63		
VSWR	MHz	#S	#1	#2	#3	#4	#5	#6	#7	#8
	5.00	1.30	1.36	1.36	1.38	1.38	1.35	1.35	1.37	1.37
	31.05	1.33	1.31	1.31	1.32	1.32	1.30	1.30	1.31	1.31
	57.11	1.38	1.27	1.28	1.28	1.28	1.25	1.26	1.27	1.27
	109.21	1.51	1.28	1.29	1.29	1.29	1.23	1.24	1.26	1.26
	161.32	1.63	1.30	1.31	1.32	1.31	1.23	1.24	1.26	1.27
	213.42	1.71	1.32	1.33	1.33	1.32	1.22	1.23	1.26	1.26
	265.53	1.73	1.32	1.32	1.33	1.32	1.20	1.21	1.25	1.25
	317.63	1.68	1.31	1.31	1.31	1.30	1.17	1.18	1.23	1.23
	395.79	1.50	1.28	1.27	1.27	1.26	1.15	1.15	1.20	1.21
	500.00	1.19	1.27	1.25	1.23	1.23	1.17	1.15	1.22	1.22

Power Splitter/Combiners

16 WAY-O°

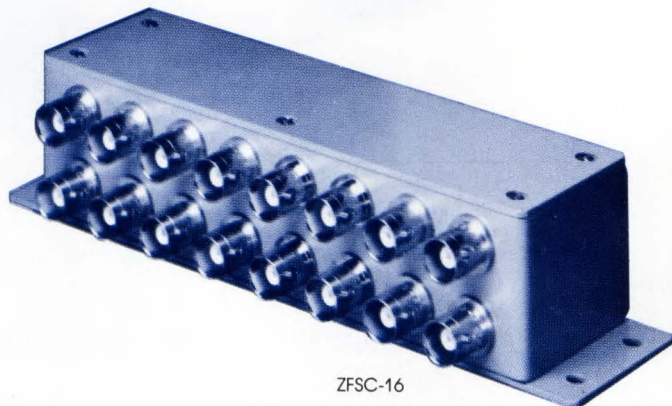
10 KHz to 200 MHz

performance data

curves, tables, page 4 Model Index

case style selection

outline drawings see page 3



ZFSC-16

MODEL NO.	FREQ. RANGE MHz f_L - f_U	ISOLATION dB						INSERTION LOSS, dB Above 12dB						PHASE UNBALANCE Degrees			AMPLITUDE UNBALANCE dB			PRICE, \$	
		Typ.	L Min.	M	Typ.	U	Min.	Typ.	L Max.	M	Typ.	U	Max.	L	M	U	L	M	U	Ea.	Qty.
ZFSC-16-1	0.5-125	30	24	25	18	20	15	1.0	1.2	1.1	1.3	1.2	1.4	1.0	3.0	5.0	0.1	0.2	0.5	174.95	(1-4)
ZFSC-16-3	1-30	45	40	45	40	41	35	0.5	0.9	0.5	0.9	0.5	0.9	1.0	2.0	3.0	0.1	0.1	0.1	174.95	(1-4)
ZFSC-16-675	0.01-25	25	20	40	25	25	20	0.8	1.1	0.4	0.8	1.0	1.6	1.0	3.0	5.0	0.1	0.2	0.4	189.95	(1-4)
ZFSC-16-12	0.1-200	33	20	27	20	26	20	0.6	1.5	0.7	1.0	0.9	1.2	2.0	6.0	9.0	0.1	0.2	0.4	189.95	(1-4)

L = low range (f_L to $10 f_L$)

M = mid range ($10 f_L$ to $f_U/2$)

U = upper range ($f_U/2$ to f_U)

NOTES:

■ Denotes 75 ohm models, 75 ohm BNC connectors are standard.

1. Matched power rating, 1 watt
Internal load dissipation, 0.87 watt.
2. Refer to table of contents for quality control procedures, environmental specifications, and absolute maximum ratings.
3. For connector types, see case style outline drawing.
4. Prices and specifications subject to change without notice.

MIL-P-23971, *NSN GUIDE

MCL NO.

NSN

ZFSC-16-1

5820-01-120-9321

*Units are not QPL listed.



Mini-Circuits

P.O. BOX 166, Brooklyn, New York 11235 (718) 934-4500

50 ohms and 75 ohms

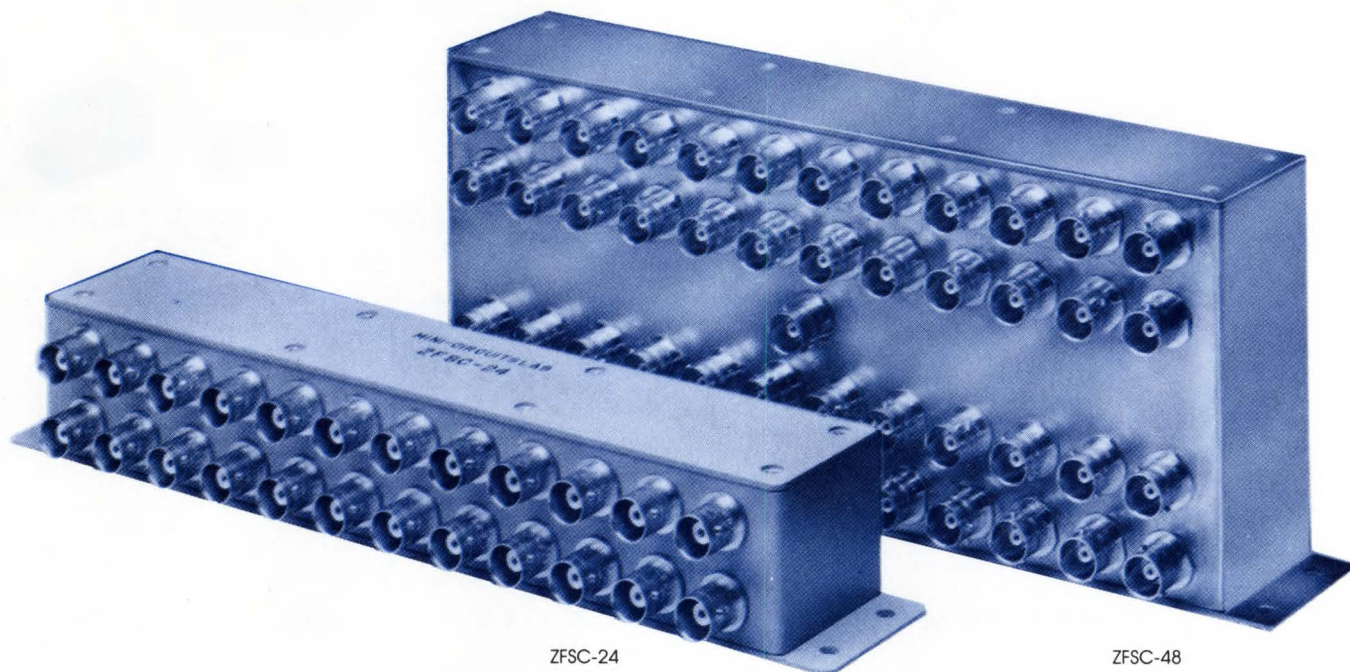
Mini-Circuits

24 WAY-O°

25 KHz to 200 MHz

48 WAY-O°

10 MHz to 300 MHz



ZFSC-24

ZFSC-48

MODEL NO.		FREQ. RANGE MHz f_L - f_U	ISOLATION dB						INSERTION LOSS, dB 24 way (above 13.8dB) 48 way (above 16.8dB)						PHASE UNBALANCE Degrees			AMPLITUDE UNBALANCE dB			PRICE, \$	
			L Typ. Min.		M Typ. Min.		U Typ. Min.		L Typ. Max.		M Typ. Max.		U Typ. Max.		L Max.	M Max.	U Max.	L Max.	M Max.	U Max.	Ea.	Qty.
ZFSC-24 case R31	ZFSC-24-1	0.2-100	25	20	25	20	25	20	1.0	2.0	1.0	2.0	1.0	2.0	2.0	3.0	5.0	0.2	0.4	0.5	264.95	(1-4)
	ZFSC-24-11	1-200	33	25	22	20	20	17	0.4	0.8	0.6	1.0	1.3	2.0	2.0	4.0	8.0	0.2	0.4	0.6	274.95	(1-4)
	ZFSC-24-6	0.025-50	30	25	39	30	30	25	0.4	1.0	0.4	0.8	0.6	1.2	2.0	4.0	6.0	0.2	0.3	0.4	274.95	(1-4)
ZFSC-48 case HH68	ZFSC-48-1	10-300	30	25	28	20	23	20	1.0	1.5	1.8	2.2	2.0	2.5	—	—	—	0.6	0.7	0.9	595.00	(1-4)
	ZFSC-48-1-75	10-300	30	25	28	20	23	20	1.2	2.0	2.1	2.5	2.3	3.0	—	—	—	0.6	0.7	1.0	595.00	(1-4)

L = low range (f_L to $10 f_L$)

M = mid range ($10 f_L$ to $f_U/2$)

U = upper range ($f_U/2$ to f_U)

In Stock... Immediate Delivery

very broadband Directional Couplers

10 to 30dB

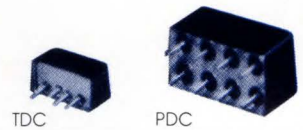
10KHz to 2000 MHz

performance data

curves, tables, page 4 Model Index

case style selection

outline drawings see page 3



	MODEL NO.	FREQUENCY	COUPLING		MAINLINE LOSS*						DIRECTIVITY						VSWR	POWER INPUT, W		PRICE, \$		
		MHz	dB	Nom.	Flatness	L		M		U		L		M		U		Typ.	L	MU	Ea.	Qty.
						f _L	f _U	Typ.	Max.	Typ.	Max.	Typ.	Max.	Typ.	Min.	Typ.	Min.					
TDC case B02	TDC 10-1	1-400	10.0±0.5	±0.5	1.2	1.5	1.0	1.3	1.2	1.5	35	25	30	20	20	15	1.5	1	2	15.95	(5-49)	
PDC case A01	PDC-10-1	0.5-500	11.5±0.5	±0.6	0.85	1.3	0.65	1.0	0.85	1.3	32	25	32	25	22	15	1.2	1.5	3	11.95	(5-49)	
	PDC-10-2	250-1000	10.5±0.5	±1.0	1.1	1.4	—	—	1.6	1.9	40	30	30	20	20	15	1.5	—	5	27.95	(5-49)	
	▲PDC-10-21	1-1000	11±0.5	±0.5	1.2	1.7	1.2	1.2	1.6	2	40	30	25	20	25	20	1.2	1	2	24.95	(5-49)	
	PDC-10-22	5-750	11±0.5	±0.5	1.1	1.6	1.2	1.7	1.6	1.9	35	30	25	20	25	20	1.25	1	2	19.95	(5-49)	
	PDC-15-6	0.01-35	15±0.5	±0.5	0.3	0.6	0.2	0.4	0.3	0.6	38	30	35	25	28	20	1.15	2	4	19.95	(5-49)	
	†PDC-20-1	25-400	21±0.75	±0.5	0.2	0.25	0.3	0.35	0.35	0.5	25	20	35	25	25	20	1.25	3	5	19.95	(5-49)	
	PDC-20-3	0.2-250	19.5±0.5	±0.5	0.35	0.6	0.25	0.5	0.35	0.6	36	30	33	25	25	20	1.2	1.5	4	13.95	(5-49)	
	■PDC-10-1-75	1-250	10.5±0.5	±0.75	1.1	1.5	1.1	1.5	1.1	1.5	30	20	30	20	30	20	2	2	4	12.95	(5-49)	
	■PDC-15-6-75	0.02-35	14.5±0.5	±0.5	0.3	0.7	0.3	0.7	0.3	0.7	35	20	35	20	35	20	1.3	1.5	4	20.95	(5-49)	
	■PDC-20-3-75	1-150	19.5±0.5	±0.75	0.35	0.8	0.35	0.8	0.35	0.8	25	20	25	20	25	20	2	2	4	12.95	(5-49)	

L=low range (f_L to 10 f_L)

M=mid range (10 f_L to $f_U/2$)

U=upper range ($f_U/2$ to f_U)

NOTES:

- * Includes theoretical power loss at coupled port.
- Denotes 75 ohm models, 75 ohm BNC connectors are standard.
- † Models PDC-20-1, ZDC-20-1, ZMDC-20-1:
L=25-50 MHz, M=50-300 MHz, U=300-400 MHz
- Model ZFDC-20-5: above 1000 MHz, coupling flatness ±1.5dB
- ▲ Models PDC-10-21, ZFDC-10-21: Upper range coupling ±0.75dB
- 1. For quality control procedures, see page 6.
- 2. For environmental specifications see page 7.
- 3. For connector types and case mounting options, see case style outline drawing.
- 4. Prices and specifications subject to change without notice.
- 5. All models are licensed under U.S. Patent 3,426,298.

MIL-M-15370/18, NSN GUIDE*

MCL NO.	NSN	MIL-M-15370/18*
PDC-10-1		002
PDC-10-2		008
PDC-10-21	5985-01-130-0177	003
PDC-20-3	5985-01-076-8477	001
ZDC-10-1-BNC	5985-01-125-3467	
ZDC-20-3-BNC	5985-01-096-5007	
ZFDC-20-5	5985-01-097-2192	

*units are not QPL listed

pin and coaxial connections

see case style outline drawing

Series	In	Out	Cpl	Case Ground	Not Used
PDC	1	4	3	2,5,7,8	6
TDC	1	2	4	3	—
ZEDC	1	2	3	—	—
ZMDC	3	2	1	—	—
ZDC	3	2	1	—	—
ZFDC	1	2	3	—	—
(except 20-4, -5)					
ZFDC 20-4, -5	3	1	2	—	—

50 ohms and 75 ohms

Mini-Circuits



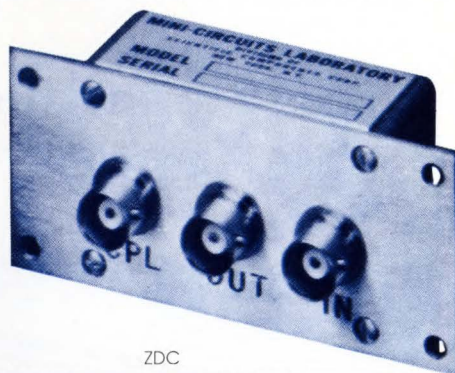
ZEDC



ZFDC



ZMDC



ZDC

	MODEL NO.	FREQ. MHz	COUPLING dB		MAINLINE LOSS* dB						DIRECTIVITY dB						VSWR	POWER INPUT, W		PRICE, \$	
		f _L -f _U	Nom.	Flatness	L		M		U		L		M		U		Typ.	L Max.	MU Max.	Ea.	Qty.
					Typ.	Max.	Typ.	Max.	Typ.	Max.	Typ.	Min.	Typ.	Min.	Typ.	Min.					
ZEDC case V37	ZEDC-10-2	1-1000	11±0.5	±0.75	1.3	1.5	1.5	1.8	1.5	1.8	35	30	30	20	18	13	1.3	1.5	3	54.95	(4-24)
	ZEDC-15-2	1-1000	15±0.5	±0.5	0.5	1.0	0.8	1.2	1.0	1.4	35	30	30	25	25	15	1.15	1.5	3	54.95	(4-24)
ZFDC case K18	ZFDC-10-1	1-500	10.5±0.25	±0.6	1.0	1.3	0.8	1.1	1.0	1.3	32	25	33	25	22	15	1.2	1.5	3	29.95	(4-24)
	ZFDC-10-2	10-1000	10.75±0.5	±0.5	1.5	2.0	1.2	1.6	1.5	2.0	35	28	30	25	27	20	1.5	1.5	3	39.95	(4-24)
	▲ZFDC-10-21	1-1000	11±0.5	±0.5	1.2	1.7	1.2	1.7	1.6	2.0	40	30	25	20	25	20	1.2	1	2	44.95	(4-24)
	ZFDC-10-22	1-750	11±0.5	±0.5	1.1	1.6	1.2	1.7	1.4	1.9	35	30	25	20	25	20	1.25	1	2	34.95	(4-24)
	ZFDC-15-6	0.03-35	15±0.5	±0.5	0.3	0.6	0.2	0.4	0.3	0.6	38	30	35	25	28	20	1.15	2	4	34.95	(4-24)
	ZFDC-20-3	0.2-250	19.5±0.5	±0.25	0.35	0.6	0.25	0.5	0.35	0.6	36	25	33	25	25	20	1.2	1.5	4	29.95	(4-24)
	ZFDC-20-4	1-1000	19.5±0.5	±0.5	1.2	1.5	0.6	0.8	1.2	1.5	36	28	27	20	23	18	1.1	5	2	59.95	(1-4)
	●ZFDC-20-5	0.1-2000	19.5±0.5	±0.5	0.3	1	0.7	1.4	1.5	2.3	30	20	27	20	22	10	1.2	.5	2	79.95	(1-4)
	■ZFDC-15-6-75	0.02-35	14.5±0.5	±0.5	0.3	0.7	0.3	0.7	0.3	0.7	35	20	35	20	35	20	1.3	1.5	4	35.95	(4-24)
	ZMDC case M21	ZMDC-10-1	0.5-500	11.5±0.5	±0.6	0.85	1.3	0.65	1.0	0.85	1.3	32	25	32	25	22	15	1.2	1.5	3	39.95
	ZMDC-10-2	250-1000	10.5±0.5	±0.5	1.1	1.4	—	—	1.6	1.9	40	30	30	20	20	15	1.5	—	5	47.95	(4-24)
	ZMDC-15-6	.01-35	15±0.5	±0.5	0.4	0.6	0.2	0.4	0.4	0.6	38	30	35	25	28	20	1.15	2	4	47.95	(4-24)
	†ZMDC-20-1	25-400	21±0.75	±0.5	0.2	0.25	0.3	0.35	0.35	0.5	25	20	35	25	25	20	1.25	3	5	47.95	(4-24)
	ZMDC-20-3	0.2-250	19.5±0.5	±0.5	0.35	0.5	0.25	0.5	0.35	0.6	36	30	33	25	25	20	1.2	1.5	4	39.95	(4-24)
	ZMDC-30-1	0.1-250	30±0.5	±0.5	0.4	0.6	0.5	0.8	0.55	0.85	23	18	20	15	17	10	1.5	1.0	3	39.95	(4-24)
ZDC case M22	ZDC-10-1	0.5-500	11.5±0.5	±0.6	0.85	1.3	0.65	1.0	0.85	1.3	32	25	32	25	22	15	1.2	1.5	3	29.95	(4-24)
	ZDC-10-2	250-1000	10.5±0.5	±0.5	1.1	1.4	—	—	1.6	1.9	40	30	30	20	20	15	1.5	—	5	37.95	(4-24)
	ZDC-15-6	.01-35	15±0.5	±0.5	0.3	0.6	0.2	0.4	0.3	0.6	38	30	35	25	28	20	1.15	2	4	37.95	(4-24)
	†ZDC-20-1	25-400	21±0.75	±0.5	0.2	0.25	0.3	0.35	0.35	0.5	25	20	35	25	25	20	1.25	3	5	37.95	(4-24)
	ZDC-20-3	0.2-250	19±0.5	±0.5	0.35	0.6	0.25	0.5	0.35	0.6	36	30	33	25	25	20	1.2	1.5	4	29.95	(4-24)
	■ZDC-10-1-75	1-250	10.5±0.5	±0.75	1.1	1.5	1.1	1.5	1.1	1.5	30	20	30	20	30	20	2	2	4	29.95	(4-24)
	■ZDC-15-6-75	.02-35	14.5±0.5	±0.6	0.3	0.6	0.2	0.4	0.4	0.6	35	30	35	25	28	20	1.5	2	4	38.95	(4-24)
	■ZDC-20-3-75	1-150	19.5±0.5	±0.75	0.35	0.8	0.35	0.8	0.35	0.8	25	20	25	20	25	15	2	2	4	30.95	(4-24)
	■ZDC-2375	55-85	10.5±0.5	±0.5	1.6	2.1	1.6	2.1	1.6	2.1	35	30	35	30	35	30	1.3	—	4	38.95	(4-24)
	■ZDC-20-3-75-1	55-90	18.6±0.5	±0.3	0.4	0.6	0.4	0.6	0.4	0.6	35	30	35	30	35	30	1.2	—	4	38.95	(4-24)

L = low range (f_L to 10 f_L)

M = mid range (10 f_L to $f_U/2$)

U = upper range ($f_U/2$ to f_U)

PDC-10-1



computer-automated performance data
typical production unit / for data of other models consult factory

FREQUENCY (MHz)	MAINLINE LOSS (dB)	COUPLING (dB)	DIRECTIVITY (dB)	IN	VSWR OUT	CPL
.50	.73	11.17	37.21	1.11	1.13	1.09
26.789	.62	11.50	36.92	1.10	1.13	1.06
53.078	.66	11.49	36.96	1.09	1.13	1.08
105.656	.72	11.52	36.48	1.06	1.14	1.09
158.234	.74	11.52	35.07	1.04	1.14	1.12
210.812	.81	11.60	32.60	1.02	1.15	1.12
263.39	.84	11.59	30.32	1.01	1.15	1.12
315.968	.92	11.56	27.36	1.01	1.15	1.13
368.546	.95	11.50	24.22	1.01	1.15	1.15
421.124	1.02	11.49	21.84	1.01	1.14	1.17
500.00	1.12	11.43	18.71	1.01	1.12	1.22

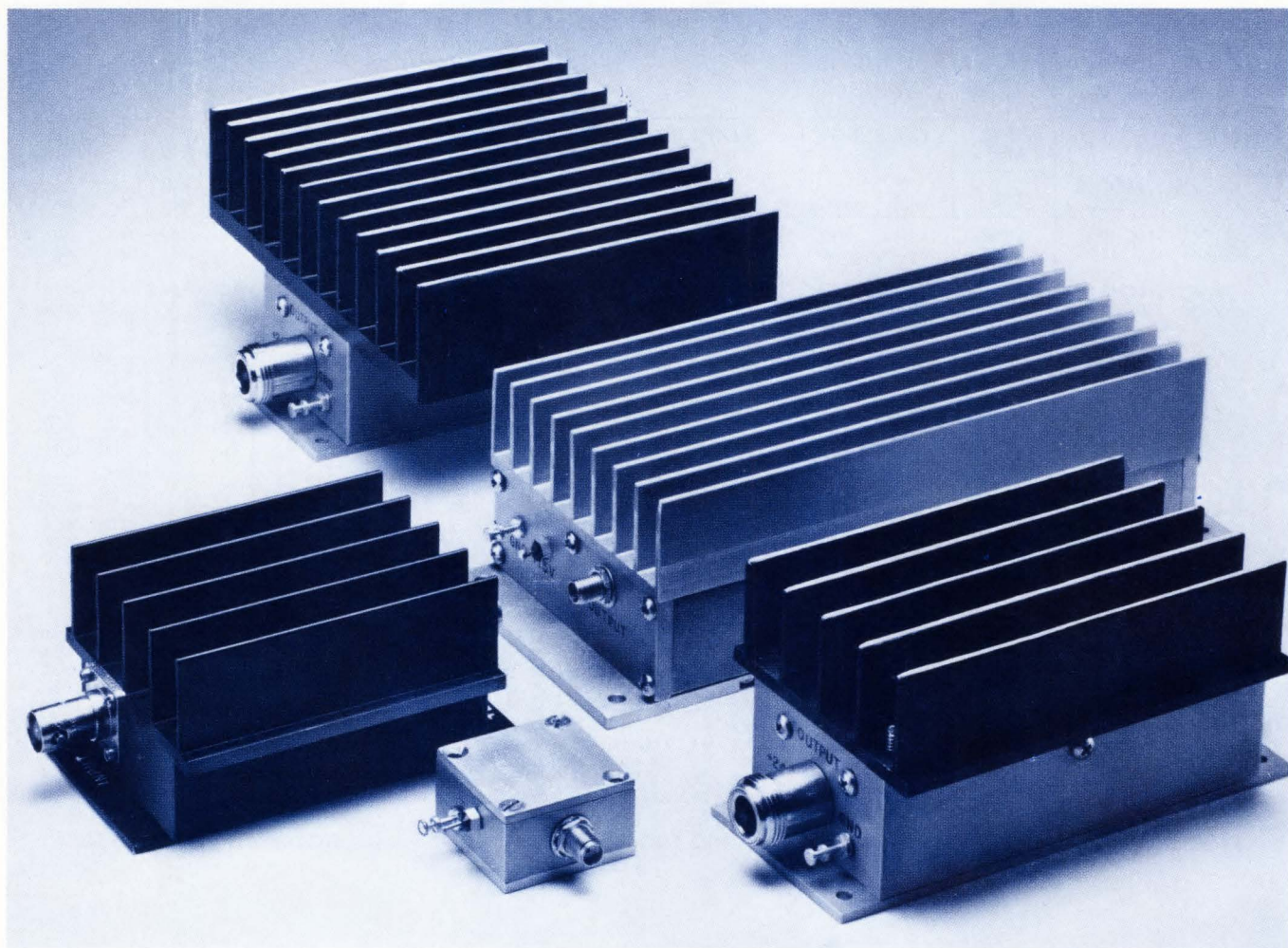
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broadband linear

Power Amplifiers

up to 2 Watts (+33 dBm)

50 KHz to 4.2 GHz



Up to 1 watt linear output at 4.2 GHz, 2 watts at 800 MHz are now available at exceptionally low prices with Mini-Circuits' line of broadband amplifiers. Ultra-linear Class A design provides unconditional stability so any load impedance may be connected without concern for damage or oscillation. These amplifiers are ideally suited for TACAN, mobile radio, telemetry, anti-collision and satellite communications systems. Use these amplifiers to boost signal/sweep generator output to achieve broadband isolation, and to provide four test setups, using only one generator with a 4-way splitter...to name just a few applications.

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50 ohms

Mini-Circuits

up to 1 Watt (+30 dBm)

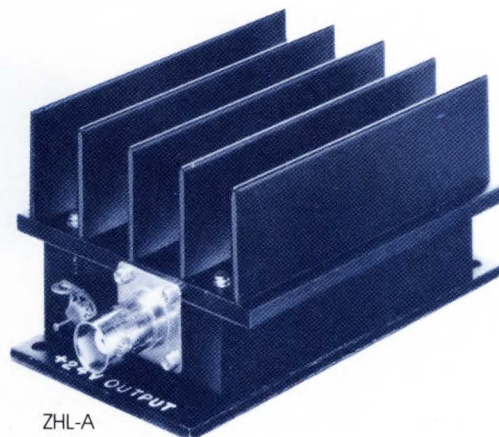
50 KHz to 500 MHz

performance data

curves, tables, page 4 Model Index

case style selection

outline drawings see page 3



ZHL-A

ZHL-A
case S 32

MODEL NO.	FREQUENCY MHz	GAIN, dB		MAXIMUM POWER, dBm		DYNAMIC RANGE		VSWR		DC POWER		PRICE \$	
		Min.	Flatness Max.	Output (1dB) Compression	Input (no damage)	NF, dB Typ.	Intercept pt., dBm 3rd order Typ.	In	Out	Volt.	Current	Ea.	Qty.
ZHL-1A	2-500	16	±1.0	+28	+20	11	+38	2:1	2:1	+24V	0.6A	199	1-9
ZHL-3A	0.4-150	24	±1.0	+29.5	+10	11	+38	2:1	2:1	+24V	0.6A	199	1-9
ZHL-32A	0.05 -130	25	±1.0	+29	+10	10	+38	2:1	2:1	+24V	0.6A	199	1-9

NOTES:

1. Operating temperature -20°C to $+65^{\circ}\text{C}$.
Storage temperature -55°C to $+100^{\circ}\text{C}$.
2. With no load on output, derate maximum input power (no damage) by 10dB.
3. Prices and specifications subject to change without notice.

MIL-M-28837/1A, NSN GUIDE

MCL NO.

NSN

ZHL-1A

6130-01-088-2322



computer-automated performance data
typical production unit / for data of other models consult factory

ZHL-1A

FREQ. (MHz)	GAIN (dB)				REVERSE GAIN (dB)				VSWR (IN)				VSWR (OUT)			
	12V	15V	20V	24V	12V	15V	20V	24V	12V	15V	20V	24V	12V	15V	20V	24V
2.00	17.90	18.27	18.46	18.52	29.03	29.07	28.96	28.88	1.09	1.13	1.14	1.14	1.10	1.16	1.15	1.15
28.21	17.88	18.27	18.48	18.52	29.53	29.72	29.54	29.24	1.09	1.11	1.13	1.14	1.20	1.19	1.19	1.18
54.42	17.88	18.33	18.54	18.59	29.57	29.62	29.58	29.39	1.12	1.12	1.13	1.14	1.24	1.24	1.24	1.24
80.63	17.94	18.41	18.65	18.70	29.91	29.78	29.64	29.56	1.19	1.17	1.16	1.16	1.30	1.29	1.30	1.30
106.84	17.90	18.41	18.69	18.78	29.85	30.12	29.97	29.75	1.31	1.24	1.21	1.21	1.36	1.36	1.37	1.37
133.05	17.91	18.42	18.75	18.83	30.02	30.06	30.15	29.87	1.42	1.32	1.28	1.27	1.41	1.41	1.42	1.44
159.26	17.68	18.34	18.71	18.81	30.25	30.32	30.03	30.00	1.56	1.42	1.36	1.34	1.46	1.48	1.50	1.52
185.47	17.64	18.34	18.78	18.84	30.50	30.36	30.12	29.99	1.71	1.553	1.45	1.43	1.50	1.53	1.57	1.60
211.68	17.52	18.25	18.74	18.82	30.50	30.64	30.19	30.05	1.83	1.63	1.52	1.50	1.51	1.56	1.63	1.67
237.89	17.46	18.20	18.73	18.81	30.85	30.64	30.35	30.32	1.96	1.72	1.59	1.57	1.52	1.58	1.67	1.73
264.10	17.34	18.09	18.66	18.74	30.99	30.75	30.40	30.43	2.04	1.79	1.64	1.62	1.48	1.56	1.66	1.75
290.31	17.28	18.03	18.58	18.69	31.08	30.89	30.66	30.58	2.14	1.86	1.69	1.66	1.44	1.53	1.66	1.76
316.52	17.33	18.08	18.69	18.79	30.64	30.77	30.51	30.49	2.16	1.88	1.70	1.67	1.40	1.50	1.64	1.75
342.73	17.32	18.06	18.69	18.79	30.50	30.44	30.41	30.44	2.17	1.87	1.69	1.65	1.33	1.43	1.59	1.71
368.94	17.30	18.04	18.71	18.79	30.09	30.23	30.24	30.27	2.09	1.81	1.63	1.59	1.27	1.35	1.49	1.62
395.15	17.23	18.02	18.67	18.82	29.81	29.95	29.91	30.18	2.03	1.75	1.57	1.53	1.24	1.28	1.41	1.55
421.36	17.32	18.13	18.83	18.98	29.19	29.36	29.52	29.85	1.96	1.68	1.49	1.44	1.32	1.29	1.36	1.50
447.57	17.37	18.23	18.96	19.08	28.50	28.79	29.05	29.22	1.90	1.61	1.41	1.36	1.47	1.36	1.34	1.43
473.78	17.17	18.10	18.90	19.08	27.94	28.28	28.64	28.82	1.93	1.64	1.42	1.37	1.68	1.51	1.39	1.42
500.00	17.07	18.14	19.06	19.26	27.68	27.17	28.22	28.50	2.07	1.79	1.57	1.54	1.01	1.79	1.61	1.58

In Stock... Immediate Delivery

Power Amplifiers

up to 2 Watts (+33 dBm)

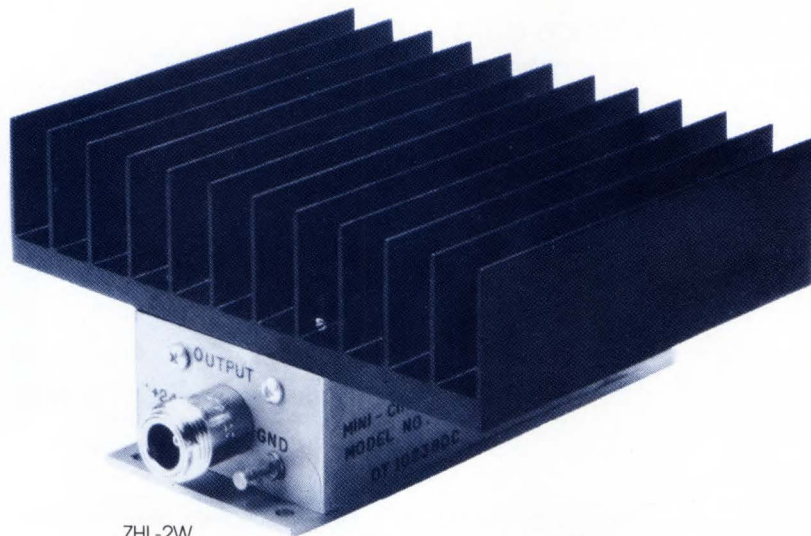
5 MHz to 800 MHz

performance data

curves, tables, page 4 Model Index

case style selection

outline drawings see page 3



ZHL-2W

MODEL NO.	FREQUENCY MHz	GAIN, dB		MAXIMUM POWER, dBm		DYNAMIC RANGE		VSWR		DC POWER		PRICE \$		
		Min.	Flatness Max.	Output (1dB) Compression	Input (no damage)	NF, dB Typ.	Intercept pt., dBm 3rd order Typ.	In	Out	Volt.	Current	Ea.	Qty.	
ZHL-2W case T 35	ZHL-1-2W ZHL-7-2W	5-500 600-800	29 28	±1.0 ±1.0	+33 +33	+10 +10	12 12	+44 +43	2:1 2:1	2:1 2:1	+24V +24V	0.9A 0.9A	495 525	1-9 1-9

NOTES:

1. Operating temperature -20°C to $+65^{\circ}\text{C}$.
Storage temperature -55°C to $+100^{\circ}\text{C}$.
2. With no load on output, derate maximum input power (no damage) by 10dB.
3. Prices and specifications subject to change without notice.

ZHL-1-2W

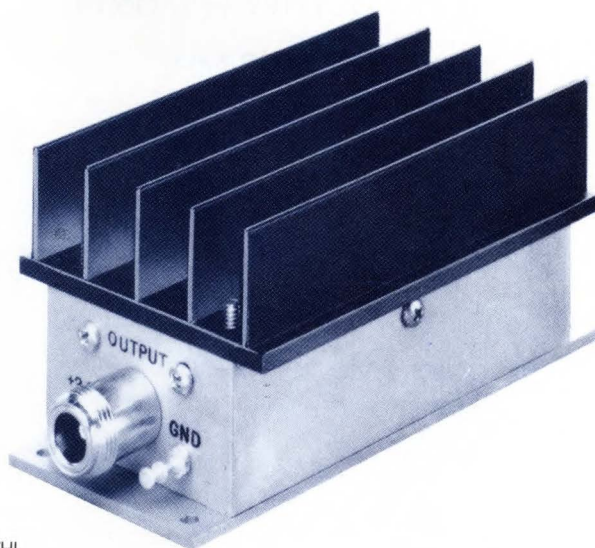
FREQ. (MHz)	GAIN (dB)	REVERSE GAIN (dB)	in	VSWR out	LINEARITY P _{out} (dBm)	Comp. (dB)
5.00	32.25	16.59	1.46	1.65	32.86	0.25
031.05	31.64	17.55	1.39	1.67	32.74	0.26
057.10	31.58	16.46	1.38	1.70	32.70	0.36
083.15	31.59	17.70	1.36	1.74	32.58	0.42
109.20	31.51	16.92	1.33	1.80	32.56	0.39
135.25	31.43	17.30	1.28	1.85	32.48	0.51
161.30	31.49	17.02	1.22	1.91	32.49	0.52
187.35	31.46	16.61	1.15	1.99	32.39	0.61
213.40	31.39	16.91	1.08	2.05	32.38	0.60
239.45	31.39	17.63	1.03	2.07	32.38	0.62
265.50	31.32	16.44	1.12	2.03	32.34	0.66
291.55	31.25	17.19	1.24	1.89	32.31	0.64
317.60	31.22	18.48	1.36	1.67	32.38	0.64
343.65	31.11	20.85	1.49	1.43	32.33	0.70
369.70	30.89	21.35	1.59	1.20	32.35	0.58
395.75	30.74	15.87	1.67	1.04	32.43	0.66
421.80	30.70	15.95	1.73	1.24	32.41	0.67
447.85	30.73	15.78	1.78	1.49	32.38	0.64
473.90	31.07	15.83	1.83	1.76	32.31	0.77
500.00	31.95	15.87	1.90	1.99	32.02	1.00

50 ohms

up to 1 Watt (+30 dBm)

10 MHz to 1200 MHz

Mini-Circuits



ZHL

MODEL NO.	FREQUENCY MHz	GAIN, dB		MAXIMUM POWER, dBm		DYNAMIC RANGE		VSWR		DC POWER		PRICE \$	
		Min.	Flatness Max	Output (1dB Compression)	Input (no damage)	NF, dB Typ.	Intercept pt, dBm 3rd order Typ.	In	Out	Volt.	Current	Ea.	Qty.
ZHL case T 34	10-1000	16	±1.0	+29	+20	18	+38	2:1	2:1	+24V	0.6A	349	1-9
ZHL-2-8	10-1000	27	±1.0	+29	+10	10	+38	2:1	2:1	+24V	0.6A	474	1-9
ZHL-2-12 *	10-1200	24	±1.0	+29*	+10	10	+38	2:1	2:1	+24V	0.75A	599	1-9

* +28.5 dBm maximum output 1000 to 1200 MHz; available only with SMA



computer-automated performance data
typical production unit / for data of other models consult factory

ZHL-2

ZHL-2-8

FREQ. (MHz)	GAIN REVERSE GAIN (dB)		VSWR in out		LINEARITY Pout Comp. (dBm) (dB)			GAIN REVERSE GAIN (dB)		VSWR in out		LINEARITY Pout Comp. (dBm) (dB)	
10.00	16.85	39.91	1.12	1.88	29.81	0.24		39.33	50.00	2.48	2.74	39.73	0.40
62.05	17.06	39.66	1.19	1.80	29.77	0.27		29.38	40.00	1.41	1.66	29.51	0.45
114.10	17.19	39.40	1.28	1.70	29.66	0.32		29.22	40.00	1.36	1.60	29.46	0.54
166.15	12.18	39.08	1.38	1.61	29.50	0.42		29.13	40.00	1.31	1.59	29.40	0.63
218.20	17.17	39.18	1.49	1.54	29.46	0.48		29.08	40.00	1.26	1.61	29.37	0.67
270.25	17.23	38.58	1.57	1.48	29.51	0.40		29.03	40.00	1.23	1.66	29.27	0.71
322.30	17.29	37.81	1.64	1.44	29.45	0.58		28.97	40.00	1.27	1.74	29.29	0.72
374.35	17.15	37.43	1.68	1.42	29.41	0.53		29.00	40.00	1.36	1.81	29.37	0.64
426.40	17.10	36.70	1.70	1.36	29.42	0.59		28.82	40.00	1.45	1.80	29.40	0.64
478.45	17.11	36.23	1.72	1.28	29.39	0.55		28.58	40.00	1.53	1.68	29.41	0.52
530.50	17.09	35.35	1.75	1.19	29.37	0.59		28.39	40.00	1.58	1.50	29.51	0.59
582.55	17.15	35.20	1.77	1.14	29.37	0.63		28.30	40.00	1.59	1.29	29.45	0.60
634.60	17.38	34.64	1.74	1.29	29.41	0.59		28.47	40.00	1.55	1.08	29.36	0.61
686.65	17.28	33.51	1.69	1.53	29.39	0.52		28.73	40.00	1.47	1.13	29.43	0.53
738.70	17.14	32.25	1.67	1.71	29.39	0.57		28.94	40.00	1.42	1.34	29.52	0.49
790.75	17.25	30.98	1.71	1.76	29.37	0.56		29.04	40.00	1.48	1.50	29.45	0.48
842.80	17.32	29.64	1.80	1.61	29.27	0.72		28.99	40.00	1.62	1.51	29.42	0.60
894.85	17.44	28.71	1.90	1.31	29.25	0.66		28.86	40.00	1.76	1.41	29.38	0.62
946.90	17.49	28.01	1.88	1.12	29.22	0.75		28.61	40.00	1.82	1.36	29.24	0.73
999.00	16.89	28.24	1.63	1.48	29.06	0.96		28.11	40.00	1.83	*1.53	29.14	0.81

In Stock... Immediate Delivery

broadband linear Power Amplifiers

up to 50mW (+17 dBm)

10 MHz to 2000 MHz

performance data

curves, tables, page 4 Model Index

case style selection

outline drawings see page 3

NEW



ZFL

MODEL NO.	FREQUENCY MHz	GAIN, dB		MAXIMUM POWER, dBm		DYNAMIC RANGE		VSWR		DC POWER		PRICE \$	
		Min.	Flatness Max	Output (1dB) Compression	Input (no damage)	NF, dB Typ.	Intercept pt., dBm 3rd order Typ.	In	Out	Volt.	Current	Ea.	Qty.
ZFL-2000	10-2000	20	±1.5	+17*	+5	7.0	+25	2:1	2:1	+15V	100mA	179	(1-9)

ZFL
case Y 39

NOTES:

* +16dBm at 1000 MHz.

1. Operating temperature -55°C to +100°C

Storage temperature -55°C to +100°C

2. With no load output, derate maximum input power (no damage) by 10 dB.

3. Prices and specifications subject to change without notice.



ZFL-2000

FREQUENCY (MHz)	GAIN (dB)	REVERSE GAIN (dB)	VSWR		LINEARITY	
			in	out	Pout (dBm)	Comp. (dB)
10.00	22.68	33.41	1.44	1.28	15.44	1.26
105.42	22.58	33.31	1.46	1.21	15.35	1.26
200.83	22.60	33.35	1.44	1.13	15.32	1.30
296.25	22.48	33.37	1.35	1.09	15.24	1.28
391.67	22.32	33.45	1.24	1.13	15.19	1.05
487.08	21.96	33.60	1.18	1.14	15.11	0.92
582.50	21.63	34.05	1.21	1.18	14.74	0.80
677.92	21.60	34.33	1.37	1.24	14.86	0.82
773.33	22.03	34.03	1.48	1.30	15.28	0.74
868.75	22.42	33.59	1.53	1.36	15.74	0.71
964.17	22.64	33.12	1.49	1.45	15.98	0.62
1059.40	22.89	32.74	1.39	1.59	16.25	0.68
1154.70	23.14	32.22	1.25	1.71	16.42	0.79
1250.20	23.44	31.64	1.05	1.76	16.54	0.88
1345.80	23.34	31.15	1.19	1.67	16.57	0.73
1441.00	23.18	30.81	1.44	1.52	16.55	0.63
1535.90	22.96	30.64	1.64	1.31	16.45	0.49
1631.50	22.64	30.73	1.77	1.10	16.22	0.38
1726.90	22.32	30.57	1.78	1.11	15.97	0.33
1822.20	22.08	30.05	1.67	1.28	15.80	0.26
1917.60	21.70	29.21	1.54	1.43	15.67	0.03
2014.80	21.03	29.26	1.55	1.53	15.58	-0.46
2108.20	20.24	28.70	1.97	1.57	15.20	-0.89
2204.00	19.23	28.44	2.93	1.48	14.47	-1.17
2299.70	18.26	28.28	4.15	1.29	13.35	-1.11

Mini-Circuits

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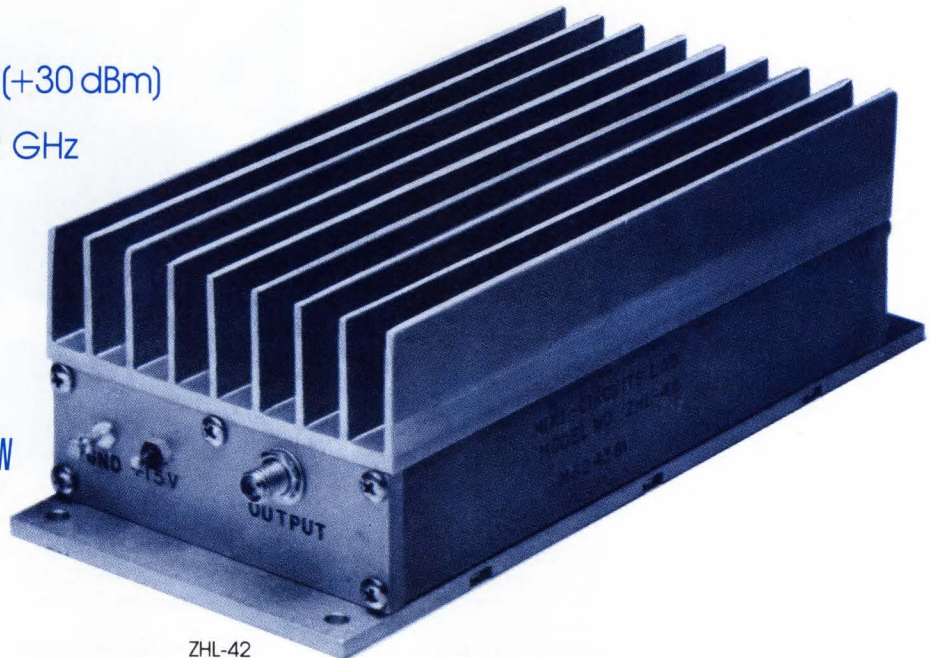
50 ohms

Mini-Circuits

up to 1 Watt (+30 dBm)

700 MHz to 4.2 GHz

NEW



ZHL-42

MODEL NO.	FREQUENCY GHz	GAIN, dB		MAXIMUM POWER, dBm		DYNAMIC RANGE		VSWR		DC POWER		PRICE \$	
		Min.	Flatness Max	Output (1dB) Compression	Input (no damage)	NF, dB Typ.	Intercept pt., dBm 3rd order Typ.	In	Out	Volt.	Current	Ea.	Qty.
ZHL-42 case U 36	0.7-4.2	30	±1.0	+29	+10	10	+38	2.5:1	2.5:1	15	0.69A	895	(1-9)

NOTES:

1. Operating temperature -20°C to +65°C
Storage temperature -55°C to +100°C
2. With no load output, derate maximum input power (no damage) by 10 dB.
3. Prices and specifications subject to change without notice.



computer-automated performance data
typical production unit / for data of other models consult factory

ZHL-42	FREQUENCY (MHz)	GAIN (dB)	REVERSE GAIN (dB)	VSWR in	out	LINEARITY Pout (dBm)	Comp. (dB)
	700.25	33.56	47.42	1.57	1.98	28.91	1.18
	845.84	33.44	47.61	1.54	1.67	28.82	1.05
	991.85	33.61	47.66	1.51	1.42	29.29	0.86
	1137.60	34.37	47.97	1.46	1.37	29.98	0.93
	1283.50	34.54	47.96	1.43	1.36	30.42	0.61
	1429.70	34.09	48.08	1.60	1.33	30.65	0.07
	1575.50	34.06	48.00	1.67	1.47	30.53	0.16
	1720.90	34.65	48.03	1.72	1.43	30.65	0.80
	1866.60	35.05	48.15	1.62	1.32	30.46	1.41
	2013.10	35.42	48.30	1.57	1.20	30.57	1.75
	2158.00	35.21	48.36	1.47	1.21	30.53	1.40
	2304.20	34.72	48.35	1.48	1.16	30.13	1.30
	2448.60	34.42	48.27	1.49	1.15	29.77	1.22
	2595.20	34.55	48.36	1.51	1.18	29.91	1.05
	2741.40	33.78	48.26	1.37	1.24	30.01	0.31
	2887.60	34.03	48.29	1.34	1.52	30.35	0.32
	2999.40	34.25	48.39	1.28	1.94	30.38	0.49
	3033.30	34.05	48.50	1.24	1.99	30.50	0.29
	3179.70	33.85	48.35	1.24	1.74	30.27	0.36
	3324.30	34.01	48.62	1.30	1.56	30.04	0.77
	3470.30	34.34	48.51	1.39	1.43	30.19	0.79
	3616.70	34.49	48.76	1.58	1.28	29.91	1.07
	3763.00	34.65	48.61	1.67	1.11	29.73	0.72
	3909.00	32.36	48.49	1.54	1.21	29.69	0.33
	4053.50	33.32	48.74	1.39	1.39	30.30	0.05
	4199.90	34.60	48.69	1.44	1.84	30.04	0.08

In Stock... Immediate Delivery

wideband

RF Transformers

3KHz to 800MHz

performance data

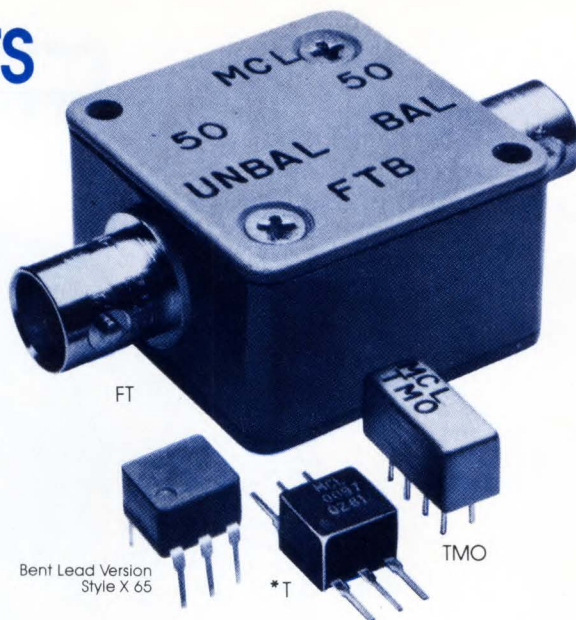
curves, tables, page 4 Model Index

case style selection

outline drawings see page 3

T, TH, case W 38, X 65*
TMO, case A 11, †case B 13
FT, FTB, case H 16

*Surface Mounting Available
See case KK81, page 18



For PC applications, select from the low-cost, plastic-case T series (small enough to be inserted into a standard 1/3 DIP socket), or the hermetically-sealed RFI shielded TMO metal-case series (requiring less PC area than a flatpack or TO-5 can), or the plastic-case T-H series designed to handle up to 100 mA in the primary winding without appreciable saturation or change in RF characteristics.

Transformer core saturation is influenced by (1) dc current through the winding, (2) RF input power, and (3) frequency of operation. These three variables interact to affect the point at which saturation occurs, see Figs. (1) and (2). These curves show the point where distortion occurs, by visual observation, and illustrate how saturation is influenced by dc current through the winding, RF input power level and frequency of operation: See that (1) if the dc current through the winding increases, the allowable RF input power decreases and the minimum frequency of operation will increase, (2) if RF input power increases, the maximum allowable dc current through the winding will decrease and the minimum frequency of operation will increase, (3) if the frequency of operation increases, then the RF input power can be increased and the dc current through the winding can also be increased.

Now comparing the T-H series to the conventional T-series in Figs. (1) and (2), note that saturation effects are negligible with the T16-1H; so for wide dynamic range applications, specify the T-H series.

Coaxial connector models are available from 10 KHz to 500 MHz and are offered with 50 ohm and 75 ohm impedances; 75 ohm connectors are used at 75 ohm ports. The FT 1.5-1, with unbalanced input and output, is especially useful for 50 ohm to 75 ohm matching applications. The FTB series with unbalanced output and balanced input (connector ground insulated from the case) helps eliminate ground loop problems, especially when long cable runs are involved.

As shown in the data chart on the following page, models are available in five basic configurations.

These transformers may be operated as low as 12.5 ohms at the primary with essentially the same impedance matching ratio and only a slight change in frequency response.

For each RF transformer model, the minimum and maximum frequency is given for the insertion loss at the 3 dB, 2 dB and 1 dB points, as shown in Fig. (3) and listed in the data chart. For example, the T1-1 insertion loss is 1 dB from 2 to 50 MHz and 3 dB from 0.15 to 400 MHz.

performance saturation curves T, TH series

(RF power & DC current at which signal saturation begins)

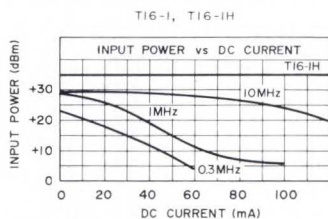


FIG. 1

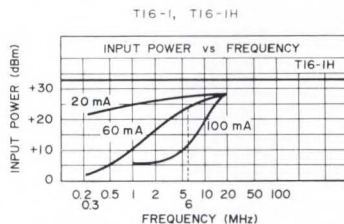


FIG. 2

frequency response curve

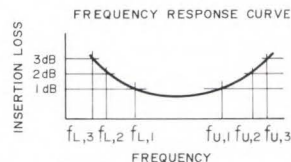


FIG. 3

NSN GUIDE

MCL NO.	NSN
T1-1	5950-01-128-3745
T2-1	5950-01-106-1218
T4-1	5950-01-024-7626
TMO4-1	5950-01-067-1012
TMO4-2	5950-01-091-3553
T9-1	5950-01-105-8153
TMO9-1A	5950-01-098-6315
T16-1	5950-01-094-7439

*FOR A AND B CONFIGURATIONS

Maximum Amplitude Unbalance
0.1 dB over 1 dB frequency range
0.5 dB over entire frequency range

Maximum Phase Unbalance
1.0° over 1 dB frequency range
5.0° over entire frequency range

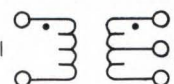
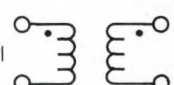
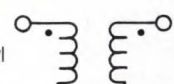
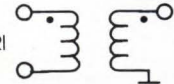
NOTES:

■ Denotes 75 ohm models, 75 ohm BNC connectors are standard.

1. For Quality Control procedures, see page 6.
2. For environmental specifications see page 7.
3. Absolute Maximum Ratings, see page 7, except for T & TH Series, temperature range is -20 to +85°C.
4. For connector types and case mounting options, see case style outline drawings.
5. Prices and specifications subject to change without notice.

Mini-Circuits

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case style number see opposite page.		MODEL NO.	Ω RATIO	FREQUENCY MHz	INSERTION LOSS			PRICE \$	
					3dB MHz	2dB MHz	1dB MHz	Ea.	Qty.
A*		T T1-1T	1	.05-200	.05-200	.08-150	.2-80	3.95	(10-49)
		T1-6T	1	.003-300	.003-300	.01-150	.02-50	5.95	(10-49)
		T2-1T	2	.07-200	.07-200	.1-100	.5-50	4.25	(10-49)
		T2.5-6T	2.5	.01-100	.01-100	.02-50	.05-20	4.25	(10-49)
		T3-1T	3	.05-250	.05-250	.1-200	.5-70	3.95	(10-49)
		T4-1	4	.2-350	.2-350	.35-300	2-100	2.95	(10-49)
		T4-6T	4	.02-250	.02-250	.05-150	0.1-100	3.95	(10-49)
		T5-1T	5	.3-300	.3-300	.6-200	.5-100	4.25	(10-49)
		T8-1T	8	.03-140	.03-140	.10-90	1-60	6.95	(10-49)
		T13-1T	13	.3-120	.3-120	.7-80	5-20	4.25	(10-49)
		T16-6T	16	.03-75	.03-75	.06-30	.1-20	4.95	(10-49)
		TH T4-1H	4	8-350	8-350	15-300	25-200	4.95	(10-49)
		TMO TMO1-1T	1	.05-200	.05-200	.08-150	.2-80	6.45	(10-49)
		TMO2-1T	2	.07-200	.07-200	.1-100	.5-50	6.75	(10-49)
		TMO2.5-6T	2.5	.01-100	.01-100	.02-50	.05-20	6.75	(10-49)
		TMO3-1T	3	.05-250	.05-250	.1-200	.5-70	6.45	(10-49)
		TMO4-1	4	.2-350	.2-350	.35-300	2-100	4.95	(10-49)
		TMO5-1T	5	.3-300	.3-300	.6-200	5-100	6.75	(10-49)
		TMO13-1T	13	.3-120	.3-120	.7-80	5-20	6.75	(10-49)
B*		TT T11-6	1	.004-500	.004-500	.02-200	.1-50	5.95	(10-49)
		TT15-1	1.5	.075-500	.075-500	.2-100	.1-50	4.95	(10-49)
		TT2.5-6	2.5	.01-50	.01-50	.025-25	.05-10	5.25	(10-49)
		TT4-1	4	.05-200	.05-200	.2-50	1-30	4.95	(10-49)
		TT25-1	25	.02-30	.02-30	.05-20	.1-10	7.95	(10-49)
		TTMO T11-1	1	.005-100	.005-100	.01-75	.05-40	10.95	(10-49)
C		T T1-1	1	.15-400	.15-400	.35-200	2-50	2.95	(10-49)
		T1-6	1	.01-150	.01-150	.02-100	.05-50	4.95	(10-49)
		T1.5-6	1.5	.1-300	.1-300	.2-150	.5-80	3.95	(10-49)
		T1.5-6	1.5	.02-100	.02-100	.05-50	0.1-25	4.95	(10-49)
		T2.5-6	2.5	.01-100	.01-100	.02-50	.05-20	3.95	(10-49)
		T4-6	4	.02-200	.02-200	.05-150	.1-100	3.95	(10-49)
		T9-1	9	.15-200	.15-200	.3-150	2-40	3.45	(10-49)
		T16-1	16	.3-120	.3-120	.7-80	5-20	3.95	(10-49)
		T36-1	36	.03-20	.03-20	.05-10	.1-5	5.95	(10-49)
		TH T11-1H	1	8-300	8-300	10-200	25-100	4.95	(10-49)
		T9-1H	9	2-90	2-90	3-75	6-50	5.45	(10-49)
		T16-1H	16	7-85	7-85	10-65	15-40	5.95	(10-49)
		TMO TMO1-1	1	.15-400	.15-400	.35-200	2-50	4.95	(10-49)
		TMO1.5-1	1.5	.1-300	.1-300	.2-150	.5-80	6.75	(10-49)
		TMO2.5-6	2.5	.01-100	.01-100	.02-50	.05-20	6.45	(10-49)
		TMO4-6	4	.02-200	.02-200	.05-150	.1-100	6.45	(10-49)
		TMO6-1	6	.3-200	.3-200	.5-150	5-50	6.45	(10-49)
		TMO9-1	9	.15-200	.15-200	.3-150	2-40	6.45	(10-49)
		TMO16-1	16	.3-120	.3-120	.7-80	5-20	6.45	(10-49)
D		T T2-1	2	.025-600	.025-600	.05-400	.5-200	3.45	(10-49)
		T3-1	3	.5-800	.5-800	.2-400	—	4.25	(10-49)
		T4-2	4	.2-600	.2-600	.5-500	.2-250	4.45	(10-49)
		T8-1	8	.15-250	.15-250	.25-200	2-100	3.45	(10-49)
		T14-1	14	.2-150	.2-150	.5-100	2-50	4.25	(10-49)
		TMO TMO2-1	2	.025-600	.025-600	.05-400	.5-200	5.95	(10-49)
		TMO3-1	3	.5-800	.5-800	.2-400	—	6.95	(10-49)
		TMO4-2	4	.2-600	.2-600	.5-500	.2-250	5.95	(10-49)
		TMO8-1	8	.15-250	.15-250	.25-200	2-100	5.95	(10-49)
		TMO14-1	14	.2-150	.2-150	.5-100	2-50	6.75	(10-49)
E		FT FT1.5-1	1.5	.1-400	.1-400	.5-200	1-100	29.95	(1-4)
		FTB FTB1-1	1	.2-500	.2-500	.5-300	10-100	29.95	(1-4)
		FTB1-6	1	.01-125	.01-125	.05-50	.1-25	29.95	(1-4)
		FTB1-1-75	1	.5-500	.5-500	5-300	10-100	29.95	(1-4)

pin connections see case style outline drawings

CONFIGURATION	*A DC Isolated Center-Tap Secondary		*B DC Isolated Center-Tap Primary, Secondary		C,E DC Isolated		D Unbalanced Primary, Secondary	
	T, TH	TMO	T	TMO	T, TH	TMO	T	TMO
Primary DOT	4	1	4	1	4	1	6	1
Primary	6	5	6	5	6	5	3◇	6◇◇
Primary CT	—	—	5	3	—	—	—	—
Secondary Dot	3	2	3	2	3	2	1	2
Secondary	1	6	1	6	1	6	3◇	6◇◇
Secondary CT	2	4	2	4	—	—	—	—
Case Gnd.	—	7,8	—	7,8	—	7,8	—	7,8

◇ pin 3 must be grounded
◇◇ pin 6 must be grounded

highest figure of merit

Phase Detectors

1000mV DC output, +7dBm RF

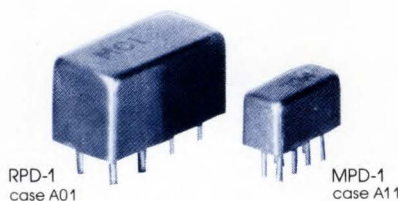
1MHz to 100 MHz

performance data

curves, tables, page 4 Model Index

case style selection

outline drawings see page 3



description

These new high efficiency phase detectors are the only units in the world offering a figure-of-merit greater than 125 for only \$15.95.

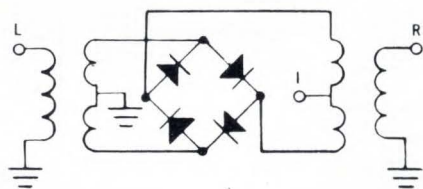
The figure-of-merit M or efficiency of a phase detector can be defined as the ratio of maximum DC output voltage (in mV) divided by the RF power (in dBm). The maximum DC output from these units is 1000 mV with +7 dBm applied to the LO and RF ports, and DC offset is typically 400 micro-volts. Thus, its figure-of-merit M is 143, which indicates a highly efficient phase detector. For comparison, a double-balanced mixer used as a phase detector offers 350 mV DC output with the same LO and RF inputs for a figure-of-merit M of 50.

Both the RPD-1 and MPD-1 are packaged in a hermetically-sealed EMI-shielded metal case. The miniature RPD-1 measures 0.4 x 0.8 x 0.4 in. and the micromin MPD-1 is only 0.2 x 0.5 x 0.25 in.

So when your system requires a high output phase detector, specify the new RPD or MPD series.

NOTES:

1. Maximum RF input power, 50mW.
peak IF current, 20mA.
2. Refer to table of contents for quality control procedures, environmental specifications, absolute maximum ratings, and hi-rel testing.
3. Prices and specifications subject to change without notice.



pin connections

see case style outline drawing

Series		RPD-1	MPD-1
REF.	L	8	8
RF in:	R	1	1
DC out:	I	*3,4	*3,4
GND.		2,5,6,7	2,5,6,7
CASE GND.		2	2

*pins must be externally connected together

applications

- Radar
- ECM Systems
- Test Instruments
- Phase-lock loops

cost (5-24)

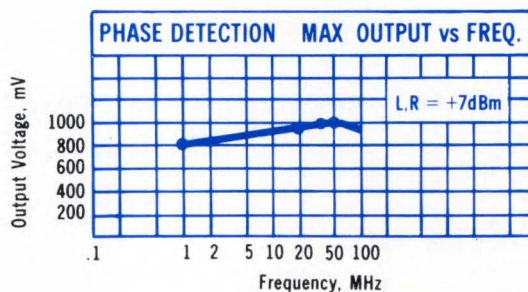
RPD-1 \$15.95

MPD-1 \$18.95

RPD-1, MPD-1 specifications

FREQUENCY RANGE:	
L and R ports	1-100 MHz
Output ports	DC-50 MHz
SCALE FACTOR	8 mV/Degree
IMPEDANCE	
L and R ports	50 ohms
I port	500 ohms
L and R SIGNAL LEVELS	+7 dBm
ISOLATION, L-R	40 dB min
MAXIMUM DC OUTPUT, mV	1000 mV typ 750 mV min
DC OUTPUT POLARITY (L and R in-phase)	Negative
DC OUTPUT OFFSET	0.2 mV typ 1 mV max
FIGURE-OF-MERIT, M	143 Typical
SIZE	
RPD-1	0.4 X 0.8 X 0.4
MPD-1	0.2 X 0.5 X 0.25

Model RPD-1



Mini-Circuits

P.O. BOX 166, Brooklyn, New York 11235 (718) 934-4500

broadband, minimal phase change

Limiters

50 ohms

 **Mini-Circuits**

+ 3 to + 20 dBm input

3 KHz to 900 MHz

performance data

curves, tables, page 4 Model Index

case style selection

outline drawings see page 3



PLS

PLS
case A01

Model No.	FREQUENCY MHz f_L f_U	INPUT dBm		*OUTPUT dBm	CONTROL CURRENT (mA) Typ.	Input range, dBm	LIMITING Δ Output/ Δ 1dB Input		PRICE, \$	
		Min.	Max.	Typ.			amp, dB	phase, deg.	Ea.	Qty.
PLS-1	0.1-150	6	20	-1.6	3	6 to 10 10 to 16 16 to 20	0.1 0.1 0.2	0.5 0.5 1.0	18.95	5-49
PLS-2	100-900	3	15	-5.0	10	3 to 8 8 to 12 12 to 15	0.2 0.4 0.2	2.0 2.0 2.0	18.95	5-49
PLS-6	0.003-1	6	20	-3.0	5	6 to 10 10 to 16 16 to 20	0.2 0.1 0.2	1.0 1.0 1.0	29.95	5-49

* Typical output level at typical control current.
Level may be changed by varying current.

pin connections

see case style outline drawing

Series	PLS		
Model	- 1	- 2	- 6
INPUT	1	1	1
OUTPUT	8	8	8
CONTROL	*3,4	*3,4	*3,4
GND.	2,5,6,7	2,5,6,7	2,5,6,7
CASE GND.	2	2,5,6,7	—

*Pins must be externally connected together

NOTES:

1. Maximum RF input power, 100mW.
Maximum control current, 10 mA.
2. Refer to table of contents for quality control procedures; environmental specifications, absolute maximum ratings, and hi-rel testing.
3. Prices and specifications subject to change without notice.

NSN GUIDE

MCL NO. NSN
PLS-1 5825-01-105-7820

PLS-1 LIMITING



computer-automated performance data
typical production unit / for data of other models consult factory

MHz	Output (20 dBm IN)	Output (16 dBm IN)	Output (10 dBm IN)	Output (6 dBm IN)	Delta, Out (20 to 16 dBm IN)	Delta, Out (16 to 10 dBm IN)	Delta, Out (10 to 6 dBm IN)
100	-1.36	-1.47	-1.77	-2.15	.11	.30	.38
7.990	-.77	-1.02	-1.28	-1.65	.25	.26	.37
15.880	-.81	-.97	-1.35	-1.65	.16	.38	.30
23.769	-.79	-.95	-1.35	-1.64	.16	.40	.29
31.658	-.77	-.94	-1.38	-1.54	.17	.44	.16
39.547	-.71	-.93	-1.34	-1.47	.22	.41	.13
47.437	-.86	-1.08	-1.41	-1.46	.22	.33	.05
55.327	-.88	-1.03	-1.40	-1.73	.15	.37	.33
63.217	-.86	-1.05	-1.48	-1.63	.19	.43	.15
71.105	-1.02	-1.01	-1.42	-1.78	-.01	.41	.36
78.995	-1.05	-1.05	-1.37	-1.57	0.00	.32	.20
86.884	-.95	-1.08	-1.49	-1.78	.13	.41	.29
94.775	-.98	-1.12	-1.40	-1.73	.14	.28	.33
102.661	-1.06	-1.15	-1.50	-1.59	.09	.35	.09
110.551	-1.14	-1.29	-1.58	-2.32	.15	.29	.74
118.440	-1.09	-1.19	-1.58	-1.98	.10	.39	.40
126.330	-1.03	-1.21	-1.53	-1.65	.18	.32	.12
134.221	-1.10	-1.31	-1.59	-2.28	.21	.28	.69
142.111	-1.19	-1.44	-1.70	-1.98	.25	.26	.28
150.000	-1.16	-1.47	-1.72	-2.07	.31	.25	.35

REMARK: Control Current: 5.6mA

In Stock... Immediate Delivery

low current, low voltage

Electronic Attenuators/Switches

1.4 to 60 dB 1 MHz to 2.5 GHz

performance data

curves, tables, page 4 Model Index

case style selection

outline drawings see page 3



		FREQUENCY MHz		INSERTION LOSS dB				IN-OUT ISOLATION dB						IN-CON ISOLATION dB						PRICE, \$		
		MODEL NO.	IN	CON	Mid-Band m		Total Range		L		M		U		L		M		U		Ea.	Qty.
			f _L -f _U			Typ.	Max.	Typ.	Max.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.	Min.	Typ.		
PAS case A01	PAS-1	5-450	DC-0.05	3.5	4.0	3.5	4.7	65	50	45	35	35	25	35	25	25	15	20	10	27.95	(5-24)	
	PAS-2	10-1000	DC-0.05	4.0	6.0	6.5	8.5	50	40	40	30	35	25	30	20	17	10	17	10	37.95	(5-24)	
	PAS-3	1-200	DC-0.05	1.4	2.0	1.6	2.5	65	50	50	40	50	35	35	25	20	15	15	10	28.95	(5-24)	
ZFAS case K18	ZFAS-15	10-2500	DC-200	3.5	4.0	3.5	5.0	20	18	35	25	30	20	19	15	28	20	20	15	89.95	(1-4)	
ZMAS case M21	ZMAS-1	5-450	DC-0.05	3.5	4.0	3.5	4.7	65	50	55	45	35	25	35	25	25	15	20	10	55.95	(4-24)	
	ZMAS-3	1-200	DC-0.05	1.4	2.0	1.6	2.5	65	50	50	40	50	35	35	25	20	15	15	10	56.95	(4-24)	
ZAS case M22	ZAS-1	5-450	DC-0.05	3.5	4.0	3.5	4.7	65	50	55	45	35	25	35	25	25	15	20	10	45.95	(4-24)	
	ZAS-3	1-200	DC-0.05	1.4	2.0	1.6	2.5	65	50	50	40	50	35	35	25	20	15	15	10	46.95	(4-24)	

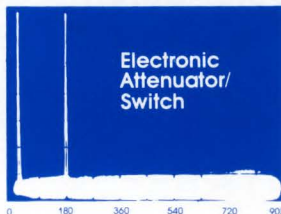
L = low range (f_L to $10 f_L$)

M = mid range ($10 f_L$ to $f_U/2$)

U = upper range ($f_U/2$ to f_U)

m = mid band ($2 f_L$ to $f_U/2$)

typical harmonic spectrum comparing attenuators
Double Balanced Mixer Vs. Electronic Attenuator



NOTES: (both pages)

- Maximum RF input power, 1 watt.
Maximum control current, 40 mA.
- Refer to table of contents for quality control procedures, environmental specifications, absolute maximum ratings, and hi-rel testing.
- For connector types and case mounting options, see case style outline drawings.
- For PSW and ZMSW models
 - VSWR 1.5 max. ("on" state)
 - Switching speed 1μ sec. max.
 - Maximum RF input +20 dBm
 - Control voltage +5V (5mA max.) on condition 0V off condition
- Prices and specifications subject to change without notice.

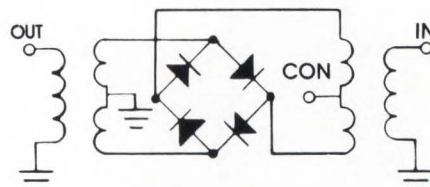
pin and coaxial connections

see case style outline drawings

Series	PAS		ZFAS	ZMAS	ZAS
Models	-1	-2	all models	all models	all models
OUT	8	8	1	1	1
IN	1	1	2	3	3
CONTROL	*3,4	*3,4	3	2	2
GND	2,5,6,7	2,5,6,7	—	—	—
CASE GND	2	2,5,6,7	—	—	—

*pins 3 and 4 must be connected together externally

schematic



NSN GUIDE

MCL NO. NSN

PAS-3

5985-01-067-3035

Mini-Circuits

P.O. BOX 166, Brooklyn, New York 11235 (718) 934-4500

pin diode

Switches

SPST/SPDT

10 to 2500 MHz

Mini-Circuits



MODEL NO.		TYPE	FREQUENCY MHz f _L -f _U	INSERTION LOSS dB low-band lw Upper band U				IN-OUT ISOLATION dB L M U						PRICE, \$	
				Typ. Max.		Typ. Max.		Typ. Min.		Typ. Min.		Typ. Min.		Ea.	Qty.
PSW case A06	PSW-1111	SPST	10-2500	1.1	1.7	1.7	2.7	50	40	35	30	28	22	29.95	(6-24)
	PSW-1211	SPDT	10-2500	1.1	1.7	1.7	2.7	50	40	35	30	28	22	29.95	(6-24)
ZMSW case JJ77	ZMSW-1111	SPST	10-2500	1.1	1.7	1.7	2.7	50	45	35	30	28	22	59.95	(1-4)
	ZMSW-1211	SPDT	10-2500	1.1	1.7	1.7	2.7	50	45	35	30	28	22	59.95	(1-4)

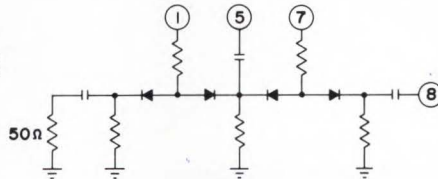
L = low range (f_L to $10 f_L$)

M = mid range ($10 f_L$ to $f_U/2$)

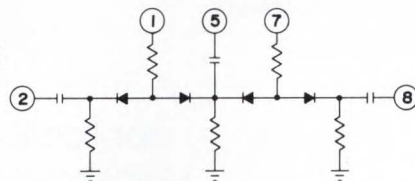
U = upper range ($f_U/2$ to f_U)

lw = low-band (f_L to $f_U/2$)

Model
PSW-1111



Model
PSW-1211



pin and coaxial connections

see case style outline drawings

Series	PSW		ZMSW	
Models	1111	1211	1111	1211
RF COMMON	5	5	com	com
RF-1 port	8	2	—	RF-1
RF-2 port	—	8	RF-2	RF-2
CONTROL RF-1	7	1	—	1
CONTROL RF-2	—	7	2	2
CONTROL 50 ohm	1	—	1	—
TERMINATION	—	—	—	—
GND	2,4	4	—	—
CASE GND	3,6	3,6	—	—



computer-automated performance data

typical production unit / for data of other models consult factory

PSW-1211

RF (MHz)	INSERTION LOSS, dB		ISOLATION, dB	
	com RF-1	com RF-2	com RF-1	com RF-2
10	-1.29	-1.38	-49.04	-49.44
110	-.93	-.97	-49.74	-49.78
210	-.91	-.90	-48.87	-44.32
310	-.92	-.84	-44.55	-45.60
410	-.83	-.71	-42.88	-44.53
610	-1.09	-.96	-39.47	-39.28
810	-1.13	-1.12	-37.53	-36.80
1010	-1.12	-1.09	-35.83	-34.95
1310	-1.14	-1.10	-33.28	-32.77
1510	-1.16	-1.12	-32.93	-32.41
1810	-1.30	-1.26	-31.80	-31.32
2010	-1.40	-1.32	-30.31	-29.93
2110	-1.45	-1.34	-28.33	-28.99
2310	-1.44	-1.31	-28.08	-28.09
2510	-1.59	-1.45	-27.89	-28.11

In Stock... Immediate Delivery

high rejection of 1st and 3rd harmonics

Frequency Doublers

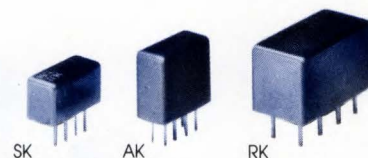
input power 0 to +20dBm

performance data

curves, tables, page 4 Model Index

case style selection

outline drawings see page 3



MODEL NO.	FREQUENCY MHz		RF INPUT PWR. dBm		CONVERSION LOSS, dB			*HARMONIC OUTPUT, dB						PRICE, \$	
	Input	Output	Min.	Max.	Input freq.	Typ.	Max.	F1		F3		F4		Ea.	Qty.
SK case B02	1-500	2-1000	1	15	1-100	13.0	15.0	40	30	50	40	16	12	21.95	(5-24)
					100-300	13.5	15.5	25	20	40	30	16	12		
					300-500	14.0	16.5	20	15	30	25	16	12		
AK case A03	1-500	2-1000	1	15	1-100	13.0	15.0	40	30	50	40	16	12	19.95	(5-24)
					100-300	13.5	15.5	25	20	40	30	16	12		
					300-500	14.0	16.5	20	15	30	25	16	12		
RK case A01	1-500	2-1000	1	15	1-100	13.0	15.0	40	30	50	40	16	12	15.95	(5-24)
					100-300	13.5	15.5	25	20	40	30	16	12		
					300-500	14.0	16.5	20	15	30	25	16	12		
RK-3 NEW	0.05-150	0.1-300	0	13	0.05- 50	11.0	13.0	40	30	45	30	16	12	14.95	(5-24)
					50-150	11.5	15.0	35	20	40	20	16	12		
RK-6	0.005-25	0.01-50	0	10	0.005-1	11.0	13.0	40	30	45	30	16	12	21.95	(5-24)
					1-25	11.5	15.0	35	20	40	20	16	12		

*Harmonic Output below power of F2.

NOTES:

1. Maximum RF input power, 200mW.
2. Refer to table of contents for quality control procedures; environmental specifications, absolute maximum ratings, and hi-rel testing.
3. For connector types and case mounting options, see case style outline drawings.
4. Prices and specifications subject to change without notice.

pin connections

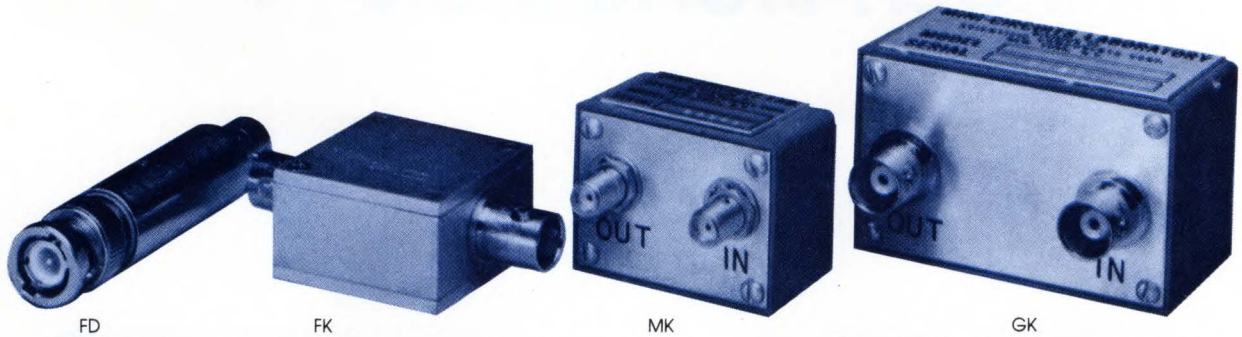
see case style outline drawing

Series	SK	RK			AK
Models	all models	- 2	- 3	- 6	all models
IN	*1,2	*1,3,4	*1,3,4	*1,3,4	*1,3,4
OUT	4	8	8	8	8
GND	3	2,5,6,7	2,5,6,7	2,5,6,7	2,5,6,7
CASE GND	3	2,5,6,7	2	—	2,5,6,7

*pins must be connected together externally

applications

- Wideband frequency multiplier chains
- Low spurious frequency multiplier chains
- FM, PM modulation chains
- Double frequency range of signal generators



MODEL NO.	FREQUENCY MHz		RF INPUT PWR. dBm		CONVERSION LOSS, dB			*HARMONIC OUTPUT, dB						PRICE, \$	
	Input	Output	Min.	Max.	Input freq.	Typ.	Max.	F1		F3		F4		Ea.	Qty.
FD-2	1-500	2-1000	1	15	1-100 100-300 300-500	13.0 13.5 14.0	15.0 15.5 16.5	40 25 20	30 20 15	50 40 30	40 30 25	16 16 16	12 12 12	32.95	(1-4)
FK-5	10-1000	20-2000	**10	20	10-600 600-1000	13.0 14.0	15.0 17.0	20	15	25	20	—	—	59.95	(1-4)
MK-2	1-500	2-1000	1	15	1-100 100-300 300-500	13.0 13.5 14.0	15.0 15.5 16.5	40 25 20	30 20 15	50 40 30	40 30 25	16 16 16	12 12 12	42.95	(1-4)
MK-3	0.05-150	0.1-300	0	13	0.05-50 50-150	11.0 11.5	13.0 15.0	40 35	30 20	45 40	30 20	16 16	12 12	37.95	(1-4)
MK-5	10-1000	20-2000	**10	20	10-600 600-1000	13.0 14.0	15.0 17.0	20	15	25	20	—	—	67.95	(1-4)
GK-2	1-500	2-1000	1	15	1-100 100-300 300-600	13.0 13.5 14.0	15.0 15.5 16.5	40 25 20	30 20 15	50 40 30	40 30 25	16 16 16	12 12 12	32.95	(1-4)
GK-3	0.05-150	0.1-300	0	13	0.05- 50 50-150	11.0 11.5	13.0 15.0	40 35	30 20	45 40	30 20	16 16	12 12	30.95	(1-4)
GK-5	10-1000	20-2000	**10	20	10-600 600-1000	13.0 14.0	15.0 17.0	20	15	25	20	—	—	57.95	(1-4)

*Harmonic Output below power of F2.

**ABOVE 700 MHz, min. input power +13dBm


computer-automated performance data
 typical production unit / for data of other models consult factory

harmonic* attenuation tables

IN FREQ. MHz	MODEL FD-2					
30	47.1	13.4	51.3	14.9	55.4	
35	47.0	13.5	51.0	14.8	54.0	
40	46.5	13.6	50.9	15.0	52.6	
45	45.9	13.6	50.7	15.2	51.4	
50	45.4	13.5	49.8	15.8	50.6	
55	43.7	13.4	47.4	15.8	50.2	
60	43.7	13.7	46.5	15.6	49.3	
65	43.4	13.7	45.4	14.7	48.7	
70	43.1	13.7	44.7	14.5	47.7	
75	43.1	13.7	44.2	14.2	47.2	
80	43.1	13.7	43.6	13.9	46.5	

1 2 3 4 5

Harmonics Order

INPUT POWER, +5dBm

IN FREQ. MHz	MODEL FK-5					
10	14.9	13.6	34.7	18.1	34.1	
20	16.5	13.0	34.8	17.3	34.5	
50	15.3	13.4	31.0	17.5	32.8	
100	15.2	13.1	26.9	16.5	29.5	
250	16.0	12.8	21.7	17.4	29.4	
500	25.4	12.6	33.6	22.5	45.7	
600	22.8	13.0	31.2	16.3	28.9	
700	22.5	13.9	38.1	16.2	26.7	
800	17.7	14.6	30.6	14.6	35.4	
900	17.5	14.6	28.0	16.2	37.2	
999	19.1	14.2	19.7	20.3	41.6	

1 2 3 4 5

Harmonics Order

INPUT POWER, +13dBm

* all harmonics except 2nd order, are relative to F2
second order is relative to IN PWR

rugged, one-piece design

Fixed Attenuators

NEW

3 to 40 dB

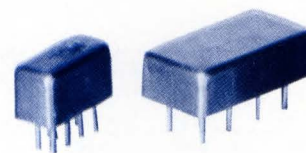
DC to 1500 MHz

performance data

curves, tables, page 4 Model Index

case style selection

outline drawings see page 3



MAT

AT

MODEL NO.	FREQUENCY MHz	ATTENUATION dB			VSWR Max.		PRICE \$	
		Nom.	Flatness	DC-1000MHz	Total Range	DC-1000 MHz	Ea.	Qty.
MAT case A11	MAT-3	DC-1500	3 ± 0.2	1.0	0.6	1.5	1.3	4.95 (10-49)
	MAT-6	DC-1500	6 ± 0.3	0.8	0.6	1.5	1.3	4.95 (10-49)
	MAT-9	DC-1500	9 ± 0.3	0.8	0.6	1.5	1.3	4.95 (10-49)
	MAT-10	DC-1500	10 ± 0.4	0.8	0.6	1.5	1.3	4.95 (10-49)
	MAT-12	DC-1500	12 ± 0.4	0.8	0.6	1.5	1.3	4.95 (10-49)
	MAT-15	DC-1500	15 ± 0.4	0.8	0.6	1.5	1.3	4.95 (10-49)
AT case A04	MAT-20	DC-1500	20 ± 0.5	1.0	0.6	1.5	1.3	4.95 (10-49)
	MAT-30	DC-1000	30 ± 0.5	—	1.0	—	1.5	4.95 (10-49)
	AT-3	DC-1500	3 ± 0.2	1.0	0.6	1.5	1.3	3.95 (10-49)
	AT-3-75	DC-1000	3 ± 0.3	—	1.0	—	1.5	3.95 (10-49)
	AT-6	DC-1500	6 ± 0.3	0.8	0.6	1.5	1.3	3.95 (10-49)
	AT-6-75	DC-1000	6 ± 0.4	—	1.0	—	1.5	3.95 (10-49)
	AT-10	DC-1500	10 ± 0.3	0.8	0.6	1.5	1.3	3.95 (10-49)
	AT-10-75	DC-1000	10 ± 0.5	—	1.0	—	1.5	3.95 (10-49)
	AT-20	DC-1500	20 ± 0.4	0.8	0.6	1.5	1.3	3.95 (10-49)
	AT-20-75	DC-1000	20 ± 0.6	—	1.2	—	1.5	3.95 (10-49)
	AT-30	DC-1000	30 ± 0.5	—	1.0	—	1.5	3.95 (10-49)
	AT-40	DC-500	40 ± 0.6	1.0	—	1.5	—	3.95 (10-49)

designers kit available

KAT-1... 4 of each (3, 6, 10, 20 dB), only \$39.95

KMAT-1... 2 of each (3, 6, 9, 10, 12, 15, 20), only \$39.95

NOTES:

■ Denotes 75 ohm models, 75 ohm BNC connectors are standard.

1. For quality control procedures, see page 6.
2. For environmental specifications see page 7.
3. Absolute Maximum Ratings, see page 7; maximum RF power; AT, CAT, NAT, TAT series (1 watt). MAT, SAT series (0.5 watt).
4. Connector models available with female/male connectors. For other versions consult factory.
5. Prices and specifications subject to change without notice.

pin connections

see case style outline drawing

SERIES	In	Out	Ground
MAT	1	8	2,3,4,5,6,7
AT	1	8	2,3,4,5,6,7

50 ohms and 75 ohms

Mini-Circuits



MODEL* NO.	FREQUENCY MHz	ATTENUATION dB			VSWR Max.		PRICE, \$ Ea.			
		Nom.	Flatness		Total Range	DC-1000 MHz	NAT	TAT	CAT	Qty.
			Total Range	DC-1000MHz						
—AT-3	DC-1500	3±0.2	1.0	0.6	1.5	1.3	15.95	12.95	11.95	(1-49)
■ CAT-3-75	DC-1000	3±0.3	—	1.0	—	1.5	15.95	12.95	11.95	(1-49)
—AT-6	DC-1500	6±0.3	0.8	0.6	1.5	1.3	15.95	12.95	11.95	(1-49)
*NAT ■ CAT-6-75	DC-1000	6±0.4	—	1.0	—	1.5	15.95	12.95	11.95	(1-49)
case FF57 —AT-10	DC-1500	10±0.3	0.8	0.6	1.5	1.3	15.95	12.95	11.95	(1-49)
*TAT ■ CAT-10-75	DC-1000	10±0.5	—	1.0	—	1.5	15.95	12.95	11.95	(1-49)
case FF58 —AT-20	DC-1500	20±0.4	0.8	0.6	1.5	1.3	15.95	12.95	11.95	(1-49)
*CAT ■ CAT-20-75	DC-1000	20±0.6	—	1.2	—	1.5	15.95	12.95	11.95	(1-49)
case FF55 —AT-30	DC-1000	30±0.5	—	1.0	—	1.5	15.95	12.95	11.95	(1-49)
—AT-40	DC-500	40±0.5	1.0	—	1.5	—	15.95	12.95	11.95	(1-49)

*add suffix letter N, T, or C to —AT, where applicable.

SAT							SAT	
case FF56	SAT-3	DC-1500	3±0.2	1.0	0.6	1.5	1.3	14.95
	SAT-6	DC-1500	6±0.3	0.8	0.6	1.5	1.3	14.95
	SAT-9	DC-1500	9±0.3	0.8	0.6	1.5	1.3	14.95
	SAT-10	DC-1500	10±0.4	0.8	0.6	1.5	1.3	14.95
	SAT-12	DC-1500	12±0.4	0.8	0.6	1.5	1.3	14.95
	SAT-15	DC-1500	15±0.4	0.8	0.6	1.5	1.3	14.95
	SAT-20	DC-1500	20±0.5	1.0	0.6	1.5	1.3	14.95
	SAT-30	DC-1000	30±0.5	—	1.0	—	1.5	14.95

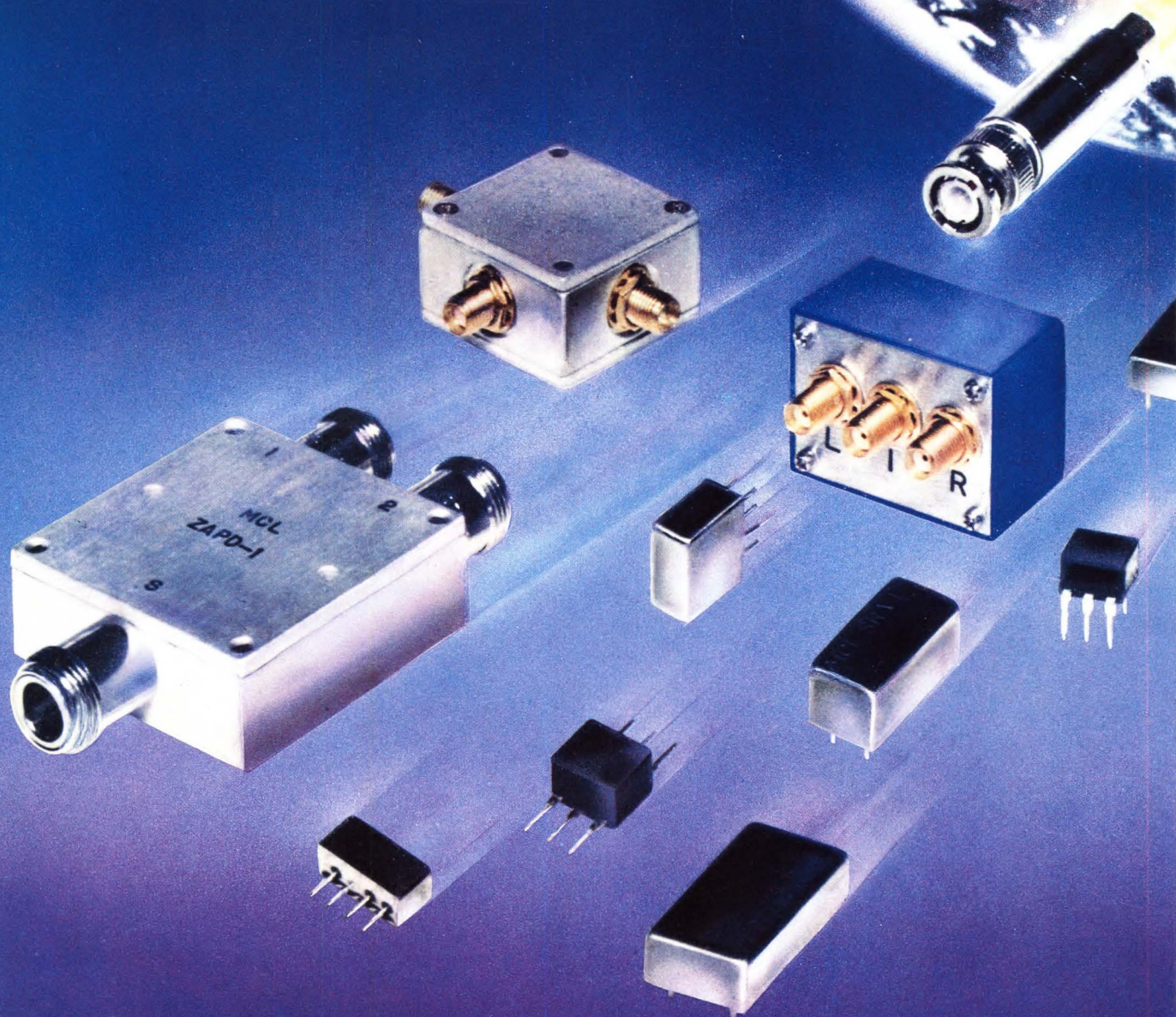


computer-automated performance data
typical production unit / for data of other models consult factory

SAT-SERIES	FREQUENCY (MHz)	SAT-3	SAT-6	SAT-10	SAT-20
	1.00	2.93	5.86	9.87	19.97
	53.526	2.98	5.87	9.91	20.01
	106.052	3.01	5.90	9.93	20.01
	158.578	3.02	5.92	9.94	20.02
	211.104	3.03	5.92	9.95	20.02
	263.63	3.05	5.93	9.95	20.02
	316.156	3.09	5.96	9.97	20.06
	368.682	3.08	5.97	9.99	20.04
	421.208	3.07	5.94	9.96	20.01
	473.734	3.12	5.98	9.98	20.00
	526.26	3.11	5.96	9.98	19.99
	578.786	3.11	5.94	9.96	19.96
	631.312	3.14	5.98	9.98	19.97
	683.838	3.18	6.01	10.04	19.99
	736.364	3.19	5.99	10.01	19.94
	788.89	3.23	6.03	10.04	19.95
	841.416	3.21	6.01	10.00	19.89
	893.942	3.25	6.04	10.05	19.92
	946.468	3.26	6.01	9.99	19.82
	999.00	3.33	6.06	10.07	19.85
	1250.00	3.52	6.20	10.36	19.77
	1500.00	3.65	6.29	10.52	19.77

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